8.0 ANALYSIS OF OPERATIONAL ALTERNATIVES

8.1 INTRODUCTION

In determining the content of this chapter, the group summarized the "Project Effects" and the "Resource Objectives" developed in sections 6 and 7, respectively, into the worksheets that follow. The "Alternatives" shown in the tables were then developed through a series of "brainstorming" sessions, designed to identify all available ideas from the individual group members without regard to legal, institutional or financial constraints or any other issues affecting the practicality of the alternatives. No attempt was or has been made to prioritize, edit, or censor this list in any way.

The group then reviewed the following list of alternatives thoroughly in the process of developing the final recommendations found in section 9.

WORKSHEET
for
ALTERNATIVE DEVELOPMENT

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
WATER QUALITY 6.1.1		
Temperature	To obtain water quality in the Yakima River and its tributaries that fully supports designated uses and meets narrative and numerical criteria of Washington State water quality standards.	1. Release reservoir water from various depths to manage temperatures. Reservoir outlet works will need to be modified. 2. Collect data and develop a comprehensive temperature model. 3. Restore riparian areas on lands acquired by Reclamation. 4. Restore river/floodplain interactions on lands acquired by Reclamation. 5. Reduce overland surface return flows. 6. Increase flows in bypass reaches with conservation. 7. Increase flows with acquisition. 8. Request a review of temperature standards for selected drains.
Sediment Pesticides/Herbicides	Meet State standards. Support the irrigation district and conservation district efforts to reduce sediment and nutrient loading in return flows.	1. Promote water conservation to improve irrigation efficiencies on-farm and reduce return flows. 2. Adopt policies to encourage clean water return flows. 3. Reclamation to report any observed water quality problems to the WDOE for enforcement. 4. Complete the process of developing SOPs for reducing fine sediment discharges from main stem diversion dams. 5. Reclamation, in cooperation with client irrigation districts, develops/utilizes a drain maintenance manual to promote clean water return flows. 6. Reclamation to actively support and participate in (1) NAWQA studies; (2) TMDL workgroups; (3) IBI assessments; and (4) Data collection/ modeling.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
WATER QUALITY 6.1.1 - continued		
		7. Develop and implement a monitoring program that is sensitive to changes in operations affecting cold water biota. 8. Report the results of Reclamation's water quality monitoring on the Yakima Project web page for the Bureau of Reclamation's Pacific Northwest Region. In addition, provide links to other relevant Yakima water quality monitoring and progress reports, prepared by the irrigation districts, NRCS, NAWQA, WDOE's 303(d) listing and TMDL program; Washington Trout (e.g., its IBI assessment), and other relevant water quality information that comes to its attention.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
WATER QUANTITY 6.1.2		
Altered Hydrograph	Establish streamflows in the Yakima River that mimic the unregulated hydrograph to the extent and frequency necessary to restore riverine ecosystem processes that support healthy, sustainable native aquatic plant and animal communities and which also provide for the efficient implementation of other legitimate project purposes.	1. Reshape the hydrograph during flood release periods. 2. Implement CAG's recommendations on water metering, enforcement, and the use of stream patrols/Federal Watermasters. 3. Develop reach-by-reach flow targets. 4. Establish interim or initial target flows for the main stem Yakima, Naches, and Tieton Rivers, for dry, wet, and average years with the RVA computer model and other existing biological and physical data. 5. Adopt a set of ecosystem indicators to measure the effectiveness of the interim flow targets in achieving conditions necessary to recover biodiversity and natural ecosystem functions, and take baseline data on all of the hydrological, biological, and other ecosystem indicators prior to implementing the initial target flows. 6. Adjust the interim target flows as indicated by monitoring data collected with the monitoring program that is sensitive to changes in operations affecting cold water biota. 7. Use the RVA on a regular basis to measure progress towards an unregulated hydrograph. 8. Monitor the ecosystem indicators on a regular basis to measure progress in attaining positive values of those indicators. 9. Combine monitoring information from the RVA and the ecosystem indicators, and other relevant information obtained from ongoing studies, adapt system management to achieve the long-term goal.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
WATER QUANTITY 6.1.2 - continued		
Fluctuating base flows (hourly). Roza gate does not allow for minor adjustments in water flows.	Stabilize base flows below Roza Diversion Dam, Prosser, Chandler, Parker, Naches at Naches, and Sunnyside.	1. Develop reregulation reservoirs. 2. Automate diversions/canals/check structures. 3. Install remote controls on all reservoirs. Provide attended staffing at each reservoir until remote controls are installed. 4. Evaluate reducing ramping rates from 2 inches/hour to 1 inch/hour and monitor established ramping rates. 5. Pass the flow fluctuations down the irrigation district's canal in conjunction with the development of reregulation reservoirs.
Excessive summer flows in some reaches.	Establish a normative hydrograph.	1. Revisit and analyze flip-flop alternatives. 2. Construct storage in mid-basin. 3. Decrease deliveries with water conservation & shorter water seasons. 4. Conjunctive use of floodplain recharge, groundwater, & surface water, including aquifer storage & recovery.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FISHERY RESOURCES 6.2	To recover and maintain self-sustaining, harvestable populations of native fish, both anadromous and resident species, throughout their historic distribution range in the Yakima basin.	
Extirpation of native anadromous sockeye salmon, summer-run chinook salmon, and coho salmon.	1. Reestablish sockeye as passage is restored at storage dams. 2. Reestablish self-sustaining coho populations. 3. Determine the feasibility of restoring summer chinook.	1. Perform a feasibility study to provide passage at all five storage reservoirs (exclude Clear Lake). 2. Provide passage for at 2 reservoirs within the next 10 years. 3. Provide passage opportunities as a project reaches the end of useful economic life (e.g., Keechelus). 4. Operate the Yakima Project to support reintroduction efforts, consistent with other uses, for sockeye, summer-run chinook, and coho salmon, considering recommendations from SOAC and River Operations groups.
Eliminated access for native salmonids to tributary and headwater habitats above storage dams. Isolation of local bull trout populations.	Provide fish passage at all storage dams.	1. Perform a feasibility study to provide passage at all five storage reservoirs (exclude Clear Lake). 2. Provide passage for at least 2 reservoirs within the next 10 years. 3. Provide passage opportunities as a project reaches the end of useful economic life (e.g., Keechelus). 4. Redesign and/or repair fish ladder at Clear Lake.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FISHERY RESOURCES 6.2 - continued		
Loss of instream habitat inundated by reservoirs and/or rendered inaccessible by storage dams.	Fully mitigate for lost habitat from inundation and inaccessibility.	1. Restore habitat/passage to tributaries above reservoirs (e.g., Cold Creek, Mill Creek, and the South Fork Tieton River). 2. Operate reservoirs at lower maximum elevation. 3 Remove one or more dams and mitigate impact to TWSA by reducing demand and/or off-channel storage. 4. Improve habitat/passage conditions downstream of reservoirs including tributaries.
Fish mortality and/or injury as a result of entrainment in the outlet works of the Rimrock and Clear Lakes storage dams.	Reduce mortality or injury as a result of entrainment in outlet works to a level that has negligible impact on recreational fisheries and no impact to sexually mature adult bull trout.	1. Install exclusion devices on intakes at the outlet works of Rimrock and Clear Lakes. 2. Reclamation develops and maintains prescribed minimum reservoir elevations at Rimrock and Clear Lakes.
Loss of gravel recruitment below Tieton Dam.	Mitigate for loss of gravel recruitment and hastened downstream transport.	1. Following revisions to flip-flop, determine appropriate gravel augmentation locations, then supplement the gravel. 2. Modify flow regime to maintain desired substrate.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FISHERY RESOURCES 6.2 - continued		
Substantial reduction in large woody debris recruitment.	Operate project to have no net negative effect on large woody debris recruitment and transport.	1. Pass/relocate large woody debris around diversions and storage facilities. 2. Stabilize or manage reservoirs to facilitate development of riparian areas around them. 3. Provide flow regimes that promote the health of riparian habitat. 4. Acquire wetlands, marginal farmland, or floodplains, and restore ecosystem functions of hydrograph and connectivity.
Upstream passage delays at diversion dams for adult anadromous salmonids. Entrainment and delay of migrating adult anadromous salmonids in diversion canals.	Configure and operate project to have no net negative effect on pre-spawning survival and eliminate need to salvage adults from project facilities.	1. Operate facilities within established NMFS and WDFW criteria at all times. 2. Replace diversion dams with pump stations. 3. Install adult exclusion devices in headworks of canals, with possible exception of Prosser, which involves potentially different circumstances. 4. Assure canals drain properly from the canal headworks to the fish bypass facility.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FISHERY RESOURCES 6.2 - continued		
Substantial smolt mortality associated with passage at diversion facilities.	Substantially improve smolt survival at diversion facilities.	1. Operate facilities within established NMFS and WDFW criteria at all times. 2. Study bypass return structures to determine the best design to reduce predation. 3. Provide more water over diversion dams with acquisition or conserved water. 4. Replace facilities with pump stations. 5. Assure canals drain properly from the canal headworks to the fish bypass facility.
Disruption of sediment transport dynamics.	Resolve to the extent practicable, associated problems downstream of diversion dams.	1. Place gravel below dams. 2. Suction dredge fine sediment from reservoir pool. 3. Where possible, conduct sediment generating maintenance activities so they occur during higher flows. 4. Complete Reclamation sediment transport study. Complete additional studies as determined necessary. Upon verification of gravel transport problem, initiate actions to resolve the problem.
Drains and wasteways that attract adult salmonids and present lethal or injurious conditions for all salmon life stages.	Improve water quality and physical habitat to a point where waterways are capable of supporting appropriate life history stages.	1. Restore physical habitat. 2. Inventory drains to determine which ones have potential to support salmon and steelhead production. 3. Restore riparian habitat. 4. Support irrigation districts' water quality improvement efforts. 5. Reduce or eliminate drain flow (prevent salmonids from entering). 6. Place exclusion devices on waterways to prevent salmonids from entering.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FISHERY RESOURCES 6.2 - continued		
Severe alteration of the natural hydrographs (streamflows) of the Yakima, Cle Elum, Bumping, Tieton, and lower Naches Rivers.	Manage for normative hydrograph for all regulated reaches of the Yakima River.	1. Conduct analysis to determine normative hydrograph. 2. Reshape delivery schedules. 3. Build basin-wide canal system to convey water. 4. Additional storage. 5. Additional water from other basins. 6. Water conservation. 7. Reduce demand. 8. Purchase water rights. 9. Implement the recommendations in the Yakima River Basin Conservation Advisory Group "ESTABLISHMENT OF A PERMANENT PLAN FOR MEASURING AND REPORTING" report. 10. Adopt a set of ecosystem indicators to measure the effectiveness of target flows, establish target flows, and monitor them to measure progress towards positive values. 11. Use existing biological and physical data to arrive at interim/initial target flows for the Yakima, Naches, and Tieton Rivers, for dry, wet, and average years.
Excessive and unnatural short-term flow fluctuations below diversions and Tieton Dam.	Manage for normative hydrograph below diversion dams and Tieton Dam in reference to short-term (hourly, daily, and weekly) flow fluctuations.	1. Automate system with gates sensitive to minor changes in pool elevations. 2. Schedule deliveries. 3. Reregulation reservoirs. 4. Reduce ramping rates. 5. Pass fluctuation down canals.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FISHERY RESOURCES 6.2 - continued		
Altered water temperature regimes, particularly in the middle and lower reaches of the Yakima River.	Provide water temperatures throughout the basin capable of supporting salmonids.	1. Use storage water to meet temperature needs downstream. 2. Recharge groundwater aquifers during non-irrigation season. 3. Expedite travel times through diversion pools. 4. With the acquisition program, acquire areas of riparian zones/floodplains that correspond to areas that historically or effectively produced cold surface and groundwater discharge.
Facilities operations and maintenance activities that result in fish mortality.	Conduct operations and maintenance activities in time and space that minimize or avoids fish mortality to the maximum extent practicable.	1. Develop long-term planning perspective for operations and maintenance activities, with capital improvements, structured to prevent catastrophic system failures.
High predation of smolts in middle and lower river.	Reduce smolt predation mortality by 50%.	1. Level canal floors to move fish faster and reduce predator holding areas. 2. Design bypass return structures with a manifold design (multiple discharges). 3. Aim sprinklers at bypass outfall returns. 4. Exclusion structures for larger (predator) fish. 5. More water over diversion. 6. Provide a more normative flow regime. 7. Determine feasibility of a predation control program.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
WILDLIFE 6.3		
Conversion of habitats to agriculture and project infrastructure.	Protect existing wildlife habitats & restore high value habitats.	1. Acquire wetlands, marginal farmland, or floodplains, and restore ecosystem functions of hydrograph and connectivity. 2. Promote wildlife incentives for irrigation districts to provide nesting cover, wetland restoration or development, and sediment retention. 3. Promote wildlife considerations as part of conservation planning for irrigation districts. 4. Hire project wildlife specialist.
Create migration barriers/mortality. Loss of winter range.	Reduce project impacts to terrestrial wildlife migration.	1. Bury pipe or bridge to reduce barriers in many canals. 2. Put in escape ramps for animals trapped in canals off-season. 3. Fence out big game where pipe, bridges, etc., are not effective. 4. Perform a wildlife assessment that identifies and prioritizes areas where wildlife mortality is a problem.
Loss of food nutrient energy source with fish runs (salmon related) indirect effect. Loss of passage over dams.		1. Remove one or more dams and mitigate impact to TWSA by reducing demand and/or off-channel storage. 2. Improve habitat/passage conditions downstream of reservoirs including tributaries.
Loss of large woody debris. Loss of wildlife food base associated with decreased abundance & distribution of salmon. Mortality caused by project structures.		1. Pass/relocate large woody debris around diversions and storage facilities. 2. Stabilize or manage reservoirs to facilitate development of riparian areas around them. 3. Provide flow regimes that promote the health of riparian habitat. 4. Acquire wetlands, marginal farmland, or floodplains, and restore ecosystem functions of hydrograph and connectivity.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
RIPARIAN VEGETATION 6.4		
Lack of riparian vegetative growth around reservoirs due to water level fluctuations. Lack of riparian vegetative growth along the main stem and tributaries of the Yakima River. Lack of riparian vegetative growth in drains developed in the natural water courses.	The restoration and protection of a healthy and functional riparian system within the water bodies serving and affected by the Yakima Project.	1. Develop a riparian inventory. 2. Complete Reaches Study. 3. Within 3 years after funding, have enough information on cottonwood and other riparian regeneration. 4. Operate Yakima Project in a manner that facilitates regeneration of riparian revegetation. 5. Develop method of monitoring health and extent of riparian areas, such as IBI, EDT, and Habitat Evaluation Procedures (HEP). 6. Develop and implement a native riparian revegetation and retention program for Yakima Project facilities. 7. Develop a YFO review process to examine activities that may have an effect on riparian quality.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FLOODPLAIN FUNCTIONS/ CHANNEL MORPHOLOGY 6.5		
Storing water in reservoirs truncates the flood peaks reducing the frequency, duration, magnitude, and spatial extent of floodplain inundation. Reduces the recharge of floodplains from overbank flow. Irrigation recharge of floodplains and groundwater changes timing, quantity, quality, and location.	Maintain properly functioning floodplains.	1. Accept more risk in the springtime operations. Change flood control guidelines. Instead of 12,000 cfs, protect Parker at 15,000 or 16,000 cfs. Involves building new flood control guidelines. 2. Go to operations that fill the reservoirs earlier.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
IRRIGATION 6.6		
	To transform irrigation in the Yakima basin to 21st century standards by encouraging the best available irrigation technologies and management practices, and by adopting policies that allow efficient use of water, including a water brokerage or other means of promoting water transfers among districts and users, and conservation-based tiered water pricing structures to support irrigation of Yakima Project lands and other lands authorized to receive Yakima Project benefits. The Project will be operated to satisfy various contracts, water rights, and court decisions.	

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
IRRIGATION 6.6 - continued		
Fish & Wildlife operation concerns stress the irrigation facilities & operations.	Revisit and analyze flip-flop alternatives.	1. Perform a reconnaissance level study of possible intra-basin transfers, e.g., the Black Rock proposal. 2. Simultaneously adopt a set of ecosystem indicators to measure the effectiveness of the interim flow targets in achieving conditions necessary to recover biodiversity and natural ecosystem functions; and take baseline data on all of the hydrological, biological, and other ecosystem indicators prior to implementing the initial target flows. 3. Provide mid-basin storage (e.g., Wymer).
Irrigation operation concerns.	Support irrigation of Yakima Project lands and other lands authorized to receive Yakima Project benefits.	1. Provide a Federal Watermaster to enforce water rights not directly managed by Reclamation. This is necessary to protect Yakima Project beneficiaries from unauthorized water withdrawals. Specifically post-1905 water rights that are junior to all Yakima Project irrigation water rights (contracts) and natural flow rights on tributaries not currently managed by a Reclamation or WDOE Watermaster.
Facilities operations and maintenance activities that would result in fish mortality in the event of a catastrophic system failure.	Develop long-term planning perspective for operations and maintenance activities, with capital improvements, structured to prevent catastrophic system failures.	1. Develop long-term planning perspective for operations and maintenance activities, with capital improvements, structured to prevent catastrophic system failures, such as Rimrock outlet works, spillway releases, and operating gates on all reservoirs during flip-flop.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
IRRIGATION 6.6 - continued		
Flood control operation concerns. Overuse of flood control operation may result in failure to fill.	Prevent unnecessary loss of storage.	1. Obtain improved runoff forecasts that would benefit TWSA & flood control predictions. 2. Accept more risk in the springtime operations. Change flood control guidelines. Instead of 12,000 cfs, protect Parker at 15,000 or 16,000 cfs. This alternative involves building new flood control guidelines. 3. Establish a flood corridor that will not be encroached on by development. (Needs cooperation from others.) 4. Perform a flood control/flood storage analysis to investigate reducing flood storage space, particularly in the spring, to allow earlier storage reservoir fill operations. Revise flood control curves to implement the analysis.
Recreation operation concerns.	Identify where it happens and minimize operations where recreation affects TWSA.	1. Continue to consider drafting Clear Lake in critical water supply years (timing may be critical).
Wapatox power operation concerns.	Wapatox Irrigation Diversion must be accommodated. Ensure there is no affect (neutral) to TWSA.	1. Fully implement court orders pertaining to use of storage water. 2. Implement studies to determine flow needed to benefit reach. Then perform a partial buyout or full buyout of Wapatox Power Plant as necessary.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
HYDROELECTRIC POWER - 6.7		
Provide water for existing power generation facilities.	Maximize generation of existing hydroelectric power facilities in a manner consistent with and subordinate to other resource objectives provided in section 7.0.	1. Continue to coincidentally generate power at existing facilities and subordinate power production as necessary to reduce environmental impacts. 2. Change time of releases to support power production.
Provide water for new power generation facilities.	Pursue development of additional generation capacity only where it can be accomplished without negatively affecting the attainment of other section 7.0 resource objectives.	1. Explore additional coincidental power production only where it would not hinder achieving other water management (or resource) objectives.

Project Effects - Section 6	Objectives - Section 7	Alternatives - Section 8
FLOOD DAMAGE REDUCTION 6.8		
Effects timing of peak events and depending on the event and space available, can decrease the magnitude of flood events.	Minimize flood damage through methods other than conventional flood control reservoir operations. To restore floodplain functions and prevent the unnecessary loss of storage capacity to flood control operations while minimizing damage to infrastructure.	1. Get improved forecasts and use them with an early warning system to reduce flood damage. 2. Establish a flood corridor that will not be encroached on by development. (Needs cooperation from others.) 3. Perform a flood control/flood storage analysis to investigate reducing flood storage space, particularly in the spring, to allow earlier storage reservoir fill operations. Revise flood control curves to implement the analysis. 4. Meet with the Corps, Federal Emergency Management Agency (FEMA), and county government to encourage them to implement non-structural flood control alternatives in the Yakima basin. 5. Match flood prone areas with high priority wetland and floodplain habitat areas, and prioritize for acquisition or other protective status such as conservation easements that would allow periodic flooding. 6. After the establishment of a flood corridor, fund, through this partnership, using existing Reclamation, Corps, FEMA, and other available Federal and State authorities and authorizations, the relocation or flood proofing of homes and businesses (e.g., gravel mining), removal of flood control structures, and acquisition of title or conservation easements for priority lands.

9.0 OPERATIONAL RECOMMENDATIONS

9.1 INTRODUCTION

The final recommendations for this Interim Operating Plan (IOP) were developed from the list of alternatives in section 8. The following worksheets show the project effect, the list of alternatives that were developed in the group's brainstorming sessions, and the 67 dissimilar recommendations the IOP Committee chose to recommend for further action or follow-up.

Many of the resulting recommendations are repetitive in an effort to maintain the integrity and thorough nature of the group's efforts and to demonstrate that many of the recommendations address multiple project effects. For example, recommendations numbered 2 and 50 are essentially the same, but appear under the 2 project effects categories which the group felt would be improved by the recommendation. The first occurrence of repetitive recommendations are in bold font and any reoccurring recommendations are in regular font.

Because this operating plan is comprehensive in nature, it necessarily includes recommendations affecting other agencies and their activities, which may be only indirectly related to project operations. In those cases, the recommendations generally provide for partnership development with those agencies.

Unlike the list of alternatives in section 8, the general view of the group was such that prior to any implementation, each recommendation should be reviewed with respect to legal/institutional constraints and scientific foundation. The group did not, however, spend much time (at least not for everyone) determining the financial implications of any particular recommendation or whether sufficient scientific data is currently available to allow the precise recommendation to be implemented without further study, modeling, or data collection.

The list of recommendations reflects the general agreement of all members of the group who participated in its development, though not necessarily the complete consensus of every group member. As has been previously pointed out, this IOP is indeed "interim." It is anticipated that the Yakima Field Office staff or other basin interests will determine if the plan (recommendation's section) needs to be updated within a few years to reflect new knowledge gained from any number of sources. Experience in implementation of the recommendations or new scientific findings relative to the needs of the fish in the basin are two examples of developments which would prompt the need to update the IOP.

The scope of the recommendations is recognized to be quite large. Due to financial constraints combined with legal and contractual issues, it is likely that the Yakima Field Office will be able, practically, to implement only some of these recommendations. It is anticipated that the selected recommendations will be implemented over a period of many years. Some recommendations could require environmental impact statements prior to implementation. In addition, those

recommendations that serve to directly improve Reclamation's ability to meet Endangered Species Act responsibilities or Yakama Nation trust responsibilities would likely be given priority.

The recommendations involving large dollar modifications, such as the construction of large structures or fish ladders at major dams, will require congressional authorization and appropriations. Typically those modifications would require a full feasibility level study prior to congressional action. Constituents will need to initiate the needed congressional actions on a collaborative basis prior to any Reclamation implementation. As a Federal agency, Reclamation is by law not allowed to participate in any lobbying activity for such projects.

Each recommendation should be monitored or evaluated to document its benefits. The type of monitoring/evaluation should be specific to the action implemented. However, a long-term baseline monitoring plan should be considered as a means to evaluate the overall achievements of the implemented actions. The monitoring/evaluation plan should seek to obtain baseline information, determine the effectiveness of the action, and identify areas for improvement. Adaptive management should be applied based on the results of monitoring. The Yakama Nation, Washington Department of Fish & Wildlife (WDFW), Reclamation, and others have active monitoring and research projects ongoing in the basin and, where possible, information from those studies should be incorporated into monitoring/evaluation plans for the implements actions (appendix H, list of current monitoring projects).

Any recommendations to investigate storage options in the basin carry with them the follow caveat: The natural hydrograph has been significantly modified by the current reservoir system and the operation of the Yakima Project for irrigation. Additional storage in the basin could further adversely affect the natural flow regime. The existing flow regime does not serve the needs of the fishery and other natural resource objectives, and, in significantly water-short years, even the interests of irrigation, at least in its current configuration and management practices.

All members of IOP agree that a better balance must be struck in favor of the aquatic ecosystem, including the native fish resource, and water quality, among other natural resources. Finding the correct balance of options to advance the legitimate water needs of all interest will require a much more disciplined and complete analysis of options than has occurred in the past. Any proposed storage must be designed to meet critical needs, which must be clearly delineated and justified.

If a legitimate need is identified and the extent of that need carefully circumscribed, a range of alternatives to meeting the need must be carefully assessed. The members of IOP are committed to least cost options, and cost analyses must include quantification of the environmental costs and benefits of various alternatives and mixes of alternatives. Some water conservation options, for instance, carry with them not only the potential to increase flows in reaches between diversion and return flows, but also to reduce the consumptive use of water (e.g., no longer watering vegetation along canals), water quality improvements, the benefits of increased crop production from more efficient on-farm systems, and the like, which must be taken into consideration in

analyzing the costs and benefits of other options to increase the flexibility of the water supply, such as new storage.

Another extremely important factor for analysis of alternatives if the extent of water use by each crop in the basin relative to the market value of water in the Yakima basin. In 2001, the price of water for irrigation (and instream flows) varied from $50/acre-foot to almost $500/acre-foot, depending on the time, place, and duration of delivery. None of these leases was for longer than the irrigation season and several were for a shorter period. The market value of water relative to crop values is thus a critical factor in the analysis of water supply and must be taken into consideration when evaluating the efficacy of the current storage system and any purported need for new storage.

WORKSHEET
for
RECOMMENDATION DEVELOPMENT

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
WATER QUALITY 6.1.1		
Temperature	1. Release reservoir water from various depths to manage temperatures. Reservoir outlet works will need to be modified. 2. Collect data and develop a comprehensive temperature model. 3. Restore riparian areas on lands acquired by Reclamation. 4. Restore river/floodplain interactions on lands acquired by Reclamation. 5. Reduce overland surface return flows. 6. Increase flows in bypass reaches with conservation. 7. Increase flows with acquisition. 8. Request a review of temperature standards for selected drains.	1 **With the acquisition program, acquire areas of riparian zone/floodplain** that historically produced or are capable of producing cold surface and groundwater discharge. 2 **Investigate structural and non-structural ways to recharge the floodplain on lands acquired by Reclamation.** 3 **Develop a comprehensive surface water temperature model that includes ambient air temperature, water velocity, water quantity, surface/groundwater interaction, reservoir temperature stratification and release, and drain discharge temperature and amount.** 4 **Use the developed temperature model for operational changes that the model demonstrates are most likely to achieve temperature standards.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
WATER QUALITY 6.1.1 - continued		
Sediment Pesticides/Herbicides	1. Promote water conservation to improve irrigation efficiencies on-farm and reduce return flows. 2. Adopt policies to encourage clean water return flows. 3. Reclamation to report any observed water quality problems to the WDOE for enforcement. 4. Complete the process of developing SOPs for reducing fine sediment discharges from main stem diversion dams. 5. Reclamation, in cooperation with client irrigation districts, develops/utilizes a drain maintenance manual to promote clean water return flows. 6. Reclamation to actively support and participate in (1) NAWQA studies; (2) TMDL workgroups; (3) IBI assessments; and (4) Data collection/modeling. 7. Develop and implement a monitoring program that is sensitive to changes in operations affecting cold water biota. 8. Report the results of Reclamation's water quality monitoring on the Yakima Project web page for the Bureau of Reclamation's Pacific Northwest Region. In addition, provide links to other relevant Yakima water quality monitoring and progress reports, prepared by the irrigation districts, NRCS, NAWQA, WDOE's 303(d) listing and TMDL program; Washington Trout (e.g., its IBI assessment), and other relevant water quality information that comes to its attention.	5 **Complete the process of developing and using standard operating procedures for reducing fine sediment discharges from main stem diversion dams.** 6 **Report any observed water concerns problems to the WDOE or the appropriate enforcing agency for follow-up enforcement actions.** 7 **Reclamation, in cooperation with client irrigation districts, develops/utilizes a drain maintenance manual to promote clean water return flows.** 8 **Reclamation to actively support and participate in (1) NAWQA studies; (2) TMDL workgroups; and (3) IBI assessments; and (4) Data collection/modeling.** 9 **Report the results of Reclamation's water quality monitoring project on its web page. Provide links to other relevant Yakima water quality monitoring and progress reports being prepared by the irrigation districts, NRCS, NAWQA, WDOE's 303d listing and TMDL programs; Washington Trout (its IBI assessment), and any other water quality information that comes to its attention.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
WATER QUALITY - 6.1 - continued		
		10 **Investigate with WDFW and other regulatory agencies the benefits of doing instream work during higher water flows rather than the low water flows.**
Altered Hydrograph	1. Reshape the hydrograph during flood release periods. 2. Implement CAG's recommendations on water metering, enforcement, and the use of stream patrols/Federal Watermasters. 3. Develop reach-by-reach flow targets. 4. Establish interim or initial target flows for the main stem Yakima, Naches, and Tieton Rivers, for dry, wet, and average years with the RVA computer model and other existing biological and physical data. 5. Adopt a set of ecosystem indicators to measure the effectiveness of the interim flow targets in achieving conditions necessary to recover biodiversity and natural ecosystem functions, and take baseline data on all of the hydrological, biological, and other ecosystem indicators prior to implementing the initial target flows. 6. Adjust the interim target flows as indicated by monitoring data collected with the monitoring program that is sensitive to changes in operations affecting cold water biota. 7. Use the RVA on a regular basis to measure progress towards an unregulated hydrograph.	11 **Advocate the implementation of the Recommendations in the Yakima River Basin Conservation Advisory Group's "ESTABLISHMENT OF A PERMANENT PLAN FOR MEASURING AND REPORTING" report.** Appendix F 12 **Adopt a set of ecosystem indicators to measure the effectiveness of target flows, establish target flows, and monitor them to measure progress towards positive values.** 13 **Use existing biological and physical data to arrive at interim/initial target flows for the Yakima, Naches, and Tieton Rivers, for dry, wet, and average years** (See Recommendation #4 in the May 1999, "REPORT ON BIOLOGICALLY BASED FLOWS FOR THE YAKIMA RIVER BASIN" for an expanded explanation).

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
<u>WATER QUALITY 6.1.1 - continued</u>		
	8. Monitor the ecosystem indicators on a regular basis to measure progress in attaining positive values of those indicators. 9. Combine monitoring information from the RVA and the ecosystem indicators, and other relevant information obtained from ongoing studies, adapt system management to achieve the long-term goal.	
Fluctuating base flows (hourly). Roza gate does not allow for minor adjustments in water flows.	1. Develop reregulation reservoirs. 2. Automate diversions/canals/check structures. 3. Install remote controls on all reservoirs. Provide attended staffing at each reservoir until remote controls are installed. 4. Evaluate reducing ramping rates from 2 inches/hour to 1 inch/hour and monitor established ramping rates. 5. Pass the flow fluctuations down the irrigation district's canal in conjunction with the development of reregulation reservoirs.	14 **Install remote controls on all reservoirs. Provide additional staffing at each reservoir to manage ramping rates until remote controls are installed.** 15 **Evaluate the placement of reregulation reservoirs to transfer demand and other operationally induced fluctuations from the river to the districts.** 16 **Continue current ramping rates with annual review of monitoring data to determine if adjustments in rates are necessary at specific locations to reduce stranding of fish or macro-invertebrates.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
<u>WATER QUALITY 6.1.1 - continued</u>		
Excessive summer flows in some reaches.	1. Revisit and analyze flip-flop alternatives. 2. Construct storage in mid-basin. 3. Decrease deliveries with water conservation & shorter water seasons. 4. Conjunctive use of floodplain recharge, groundwater, & surface water, including aquifer storage & recovery.	17 **Review alternatives to the current flip-flop operations to determine whether other operational scenarios would better serve multi-species recovery strategy and to lessen impacts on critical aquatic habitat in the basin.** 18 **Investigate to locate off-channel mid-basin storage sites.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2		
Extirpation of native anadromous sockeye salmon, summer-run chinook salmon, and coho salmon.	1. Perform a feasibility study to provide passage at all five storage reservoirs (exclude Clear Lake). 2. Provide passage for at least 2 reservoirs within the next 10 years. 3. Provide passage opportunities as a project reaches the end of useful economic life (e.g., Keechelus). 4. Operate the Yakima Project to support reintroduction efforts, consistent with other uses, for sockeye, summer-run chinook, and coho salmon, considering recommendations from SOAC and River Operations groups.	19 **Perform a feasibility study to provide passage at all five storage reservoirs (exclude Clear Lake).** 20 **Operate the Yakima Project to support reintroduction efforts, consistent with other uses, for sockeye, summer-run chinook, and coho salmon, considering recommendations from SOAC and River Operations groups.** 21 **Provide passage at 2 reservoirs within the next 10 years**.
Eliminated access for native salmonids to tributary and headwater habitats above storage dams. Isolation of local bull trout populations.	1. Perform a feasibility study to provide passage at all five storage reservoirs (exclude Clear Lake). 2. Provide passage for at 2 reservoirs within the next 10 years. 3. Provide passage opportunities as a project reaches the end of useful economic life (e.g., Keechelus). 4. Redesign and/or repair fish ladder at Clear Lake.	22 Perform a feasibility study to provide passage at all five storage reservoirs (exclude Clear Lake). 23 **Redesign and/or repair fish ladder at Clear Lake.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2 - continued		
Loss of instream habitat inundated by reservoirs rendered inaccessible by storage dams.	1. Restore habitat/passage to tributaries above reservoirs (e.g., Cold Creek, Mill Creek, and the South Fork Tieton River). 2. Operate reservoirs at lower maximum elevation. 3. Remove one or more dams and mitigate impact to TWSA by reducing demand and/or off-channel storage. 4. Improve habitat/passage conditions downstream of reservoirs including tributaries.	24 **Restore habitat/passage to tributaries above reservoirs (such as Cold and Mill Creeks in the Keechelus basin and the South Fork Tieton River in the Rimrock basin)**. 25 **Improve habitat/passage conditions downstream of reservoirs including tributaries.**
Fish mortality and/or injury as a result of entrainment in the outlet works of the Rimrock and Clear Lakes' storage dams.	1. Install exclusion devices on intakes at the outlet works of Rimrock and Clear Lakes. 2. Reclamation develops and maintains prescribed minimum reservoir elevations at Rimrock and Clear Lakes.	26 **Install exclusion devices on intakes at the outlet works of Rimrock and Clear Lakes.**
Loss of gravel recruitment below Tieton Dam.	1. Following revisions to flip-flop, determine appropriate gravel augmentation locations, then supplement the gravel. 2. Modify flow regime to maintain desired substrate.	27 **Following revisions to flip-flop, determine appropriate gravel augmentation locations, then supplement the gravel.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2 - continued		
Substantial reduction in large woody debris recruitment.	1. Pass/relocate large woody debris around diversions and storage facilities. 2. Stabilize or manage reservoirs to facilitate development of riparian areas around them. 3. Provide flow regimes that promote the health of riparian habitat. 4. Acquire wetlands, marginal farmland, or floodplains, and restore ecosystem functions of hydrograph and connectivity.	28 **Pass/relocate large woody debris around diversions and storage facilities.** 29 **Provide flow regimes that promote the health of riparian habitat.** 30 Acquire wetlands, marginal farmland, and floodplain habitats to restore hydrologic connectivity.
Upstream passage delays at diversion dams for adult anadromous salmonids. Entrainment and delay of migrating adult anadromous salmonids in diversion canals.	1. Operate facilities within established NMFS and WDFW criteria at all times. 2. Replace diversion dams with pump stations. 3. Install adult exclusion devices in headworks of canals, with possible exception of Prosser, which involves potentially different circumstances. 4. Assure canals drain properly from the canal headworks to the fish bypass facility.	31 **Operate fish screen facilities within established NMFS and WDFW criteria at all times. The criteria is described in appendix G 1 & 2.** 32 **Install adult exclusion devices in headworks of canals, with possible exception of Prosser, where fish are gathered for the hatchery.** 33 **Assure canals drain properly from the canal headworks to the fish bypass facility to prevent stranding when the canals are shut down for the season.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2 - continued		
Substantial smolt mortality associated with passage at diversion facilities.	1. Operate facilities within established NMFS and WDFW criteria at all times. 2. Study bypass return structures to determine the best design to reduce predation. 3. Provide more water over diversion dams with acquisition or conserved water. 4. Replace facilities with pump stations. 5. Assure canals drain properly from the canal headworks to the fish bypass facility.	34 Operate fish screen facilities within established NMFS and WDFW criteria at all times. The criteria is described in appendix G 1 & 2. 35 **Study bypass return structures to determine the best design to reduce predation.** 36 **Provide more water over diversion dams with acquisition or conserved water.** 37 Assure canals drain properly from the canal headworks to the fish bypass facility to prevent stranding when the canals are shut down for the season.
Disruption of sediment transport dynamics.	1. Place gravel below dams. 2. Suction dredge fine sediment from reservoir pool. 3. Where possible, restrict sediment generating activities so they occur during high flows. 4. Complete Reclamation sediment transport study. Complete additional studies as determined necessary. Upon verification of gravel transport problem, initiate actions to resolve the problem.	38 **Complete Reclamation sediment transport study. Complete additional studies as determined necessary. Upon verification of gravel transport problem, initiate actions to resolve the problem.** 39 **Where possible, conduct sediment generating maintenance activities so they occur during higher flows.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2 - continued		
Drains and wasteways attract adult salmonids and present lethal or injurious conditions for all salmon life stages.	1. Restore physical habitat. 2. Inventory drains to determine which ones have potential to support salmon and steelhead production. 3. Restore riparian habitat. 4. Support irrigation districts' water quality improvement efforts. 5. Reduce or eliminate drain flow (prevent salmonids from entering). 6. Place exclusion devices on waterways to prevent salmonids from entering.	40 **Inventory drains to determine which ones are supporting or have potential to support salmon and steelhead production.** 41 **Reduce or eliminate false attraction impacts on drains that have little potential to support salmon and steelhead production.** 42 **Support efforts to improve or maintain habitat where possible in drains that support or have potential to support salmon and steelhead production.** 43 **Support efforts of irrigation districts to improve water quality.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2 - continued		
Severe alteration from the natural hydrographs (streamflows) of the Yakima, Cle Elum, Bumping, Tieton, and lower Naches Rivers.	1. Conduct analysis to determine normative hydrograph. 2. Reshape delivery schedules. 3. Build basin-wide canal system to convey water. 4. Additional storage. 5. Additional water from other basins. 6. Water conservation. 7. Reduce demand. 8. Purchase water rights. 9. Implement the recommendations in the Yakima River Basin Conservation Advisory Group "ESTABLISHMENT OF A PERMANENT PLAN FOR MEASURING AND REPORTING" report. 10. Adopt a set of ecosystem indicators to measure the effectiveness of target flows, establish target flows, and monitor them to measure progress towards positive values. 11. Use existing biological and physical data to arrive at interim/initial target flows for the Yakima, Naches, and Tieton Rivers, for dry, wet, and average years.	44 Implement the Recommendations in the Yakima River Basin Conservation Advisory Group "ESTABLISHMENT OF A PERMANENT PLAN FOR MEASURING AND REPORTING" report. 45 Adopt a set of ecosystem indicators to measure the effectiveness of target flows, establish target flows, and monitor them to measure progress towards positive values. 46 Use existing biological and physical data to arrive at interim/initial target flows for the Yakima, Naches, and Tieton Rivers, for dry, wet, and average years. 47 Review alternatives to the current flip-flop operations to determine if other operational scenarios would better serve a multi-species recovery strategy and to lessen impacts on critical aquatic habitat in the basin.
Excessive and unnatural short-term flow fluctuations below diversions.	1. Automate system with gates sensitive to minor changes in pool elevations. 2. Schedule deliveries. 3. Reregulation reservoirs. 4. Reduce ramping rates. 5. Pass fluctuation down canals.	48 Investigate to locate off-channel mid-basin storage reservoir sites, scheduling deliveries, automate delivery systems, reregulation reservoirs, and increase target flows by ⅔ of the saved water, as applicable.

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2 - continued		
Altered water temperature regimes, particularly in the middle and lower reaches of the Yakima River.	1. Use storage water to meet temperature needs downstream. 2. Recharge groundwater aquifers during non-irrigation season. 3. Expedite travel times through diversion pools. 4. With the acquisition program, acquire areas of riparian zone/floodplain that correspond to areas that historically or effectively produced cold surface and groundwater discharge.	49 With the acquisition program, acquire areas of riparian zones/floodplains that correspond to areas that historically or effectively produced cold surface and groundwater discharge. 50 Investigate structural and non-structural ways to recharge the floodplain. 51 Develop a comprehensive surface water temperature model that includes ambient air temperature, water velocity, water quantity, surface/groundwater interaction, reservoir temperature stratification and release, and drain discharge temperature and amount. 52 Use the developed temperature model for operational changes that the model demonstrates are most likely to achieve temperature standards.
Facilities operations and maintenance activities that would result in fish mortality in the event of a catastrophic system failure.	1. Develop long-term planning perspective for operations and maintenance activities, with capital improvements, structured to prevent catastrophic system failures.	53 **Develop long-term planning perspective for operations and maintenance activities, with capital improvements, structured to prevent catastrophic system failures, (such as Rimrock outlet works, spillway releases, and operating gates on all reservoirs during flip-flop).**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FISHERY RESOURCES 6.2 - continued		
High predation of smolts in middle and lower river.	1. Level canal floors to move fish faster and reduce predator holding areas. 2. Design bypass return structures with a manifold design (multiple discharges). 3. Aim sprinklers at bypass outfall returns. 4. Exclusion structures for larger (predator) fish. 5. More water over diversion. 6. Provide a more normative flow regime**.** 7. Determine feasibility of a predation control program.	54 Assure canals drain properly from the canal headworks to the fish bypass facility to prevent stranding when the canals are shut down for the season. 55 Study bypass return structures to determine the best design to reduce predation. 56 **Aim sprinklers at bypass outfall returns to discourage the presence of predator fish.** 57 Install adult exclusion devices in headworks of canals, with possible exception of Prosser where fish are gathered for the hatchery. 58 **Continue to work with SOAC to provide managed out-migration flows to facilitate timely emigration of smolts from the basin.** 59 **Provide a more normative flow regime**. 60 **Determine feasibility of a predation control program**.

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
WILDLIFE 6.3		
Conversion of habitats to agriculture and project infrastructure.	1. Acquire wetlands, marginal farmland, or floodplains, and restore ecosystem functions of hydrograph and connectivity. 2. Promote wildlife incentives for irrigation districts to provide nesting cover, wetland restoration or development, and sediment retention. 3. Promote wildlife considerations as part of conservation planning for irrigation districts. 4. Hire project wildlife specialist.	61 Acquire wetlands, marginal farmland and floodplain habitats to restore hydrologic connectivity. 62 **Promote wildlife incentives for irrigation districts to provide nesting cover and wetland restoration or development.** 63 **Promote wildlife considerations as part of conservation planning for irrigation districts.** 64 **Obtain wildlife expertise for project activities by hiring a wildlife specialist or contracting with other agencies.** 65 **Design in wildlife functions where possible on new Yakima Project installations.**
Creates migration barriers causing mortality. Loss of winter range.	1. Bury pipe or bridge to reduce barriers in many canals. 2. Put in escape ramps for animals trapped in canals off-season. 3. Fence out big game where pipe, bridges, etc., are not effective. 4. Perform a wildlife assessment that identifies and prioritizes areas where wildlife mortality is a problem.	66 **Bury pipe or construct bridges to reduce barriers in many canals.** 67 **Put in escape ramps for animals trapped in canals off-season.** 68 **Fence out big game where pipe, bridges, etc., are not effective.** 69 **Perform a wildlife assessment that identifies and prioritizes areas where wildlife mortality is a problem.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
WILDLIFE 6.3 - continued		
Loss of wildlife food base associated with decreased abundance & distribution of salmon.	1. Remove one or more dams and mitigate impact to TWSA by reducing demand and/or off-channel storage. 2. Improve habitat/passage conditions downstream of reservoirs including tributaries.	70 Improve habitat/passage conditions downstream of reservoirs including tributaries on land acquired by YRBWEP.
Loss of large woody debris.	1. Pass/relocate large woody debris around diversions and storage facilities. 2. Stabilize or manage reservoirs to facilitate development of riparian areas around them. 3. Provide flow regimes that promote the health of riparian habitat. 4. Acquire wetlands, marginal farmland, or floodplains, and restore ecosystem functions of hydrograph and connectivity.	71 Pass/relocate large woody debris around diversions and storage facilities. 72 Provide flow regimes that promote the health of riparian habitat.

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
RIPARIAN VEGETATION 6.4		
Lack of riparian vegetative growth around reservoirs due to water level fluctuations. Lack of riparian vegetative growth along the main stem and tributaries of the Yakima River. Lack of riparian vegetative growth in drains developed in the natural water courses.	1. Develop a riparian inventory. 2. Complete Reaches Study. 3. Within 3 years after funding, have enough information on cottonwood and other riparian regeneration. 4. Operate Yakima Project in a manner that facilitates regeneration of riparian revegetation. 5. Develop method of monitoring health and extent of riparian areas, such as IBI, EDT, and HEP. 6. Develop and implement a native riparian revegetation and retention program for Yakima Project facilities. 7. Develop a YFO review process to examine activities that may have an effect on riparian quality.	73 **Develop a riparian inventory, including: (1) the development of a method for monitoring the health and extent of riparian areas; and (2) an examination of Reclamation activities that affect riparian quality within the project area.** 74 **Develop a revegetation and retention program at project facilities where the assessment shows the need.** 75 Provide flow regimes that promote the health of riparian habitat

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
<u>FLOOD PLAIN FUNCTIONS/ CHANNEL MORPHOLOGY 6.5</u>		
Storing water in reservoirs truncates the flood peaks reducing the frequency, duration, magnitude, and spatial extent of floodplain inundation. Reduces the recharge of floodplains from overbank flow. Recharges floodplains and groundwater with irrigation water which changes the timing, quantity, quality, and location of the recharging action.	1. Accept more risk in the springtime operations. Change flood control guidelines. Instead of 12,000 cfs, protect Parker at 15,000 or 16,000 cfs. Involves building new flood control guidelines. 2. Go to operations that fill the reservoirs earlier.	76 **Analyze flood control/flood storage and based on the analysis, begin fill operations earlier in the year, shifting operations to bypass inflow once the reservoirs are filled.** 77 Complete Reclamation sediment transport study. Complete additional studies as determined necessary. Upon verification of gravel transport problem, initiate actions to resolve the problem.

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
IRRIGATION 6.6		
Fish & Wildlife operation concerns stress the irrigation facilities & operations.	1. Perform a reconnaissance level study of possible intra-basin transfers, e.g., the Black Rock proposal. 2. Simultaneously adopt a set of ecosystem indicators to measure the effectiveness of the interim flow targets in achieving conditions necessary to recover biodiversity and natural ecosystem functions; and take baseline data on all of the hydrological, biological, and other ecosystem indicators prior to implementing the initial target flows. 3. Provide mid-basin storage, e.g., Wymer.	78 **Perform a reconnaissance level study of possible intra-basin transfers** (such as the Black Rock proposal). 79 **Provide mid-basin storage** (such as groundwater storage, reregulation reservoirs, off stream storage such as Wymer, etc.).
Irrigation operation concerns.	1. Provide a Federal Watermaster to enforce water rights not directly managed by Reclamation. This is necessary to protect Yakima Project beneficiaries from unauthorized water withdrawals. Specifically post-1905 water rights that are junior to all Yakima Project irrigation water rights (contracts) and natural flow rights on tributaries not currently managed by a Reclamation or WDOE Watermaster.	80 **Provide a Federal Watermaster to enforce water rights not directly managed by Reclamation.**
Facilities operations and maintenance activities that would result in fish mortality in the event of a catastrophic system failure.	1. Develop long-term planning perspective for operations and maintenance activities, with capital improvements, structured to prevent catastrophic system failures.	81 Develop long-term planning perspective for operations and maintenance activities, with capital improvements, structured to prevent catastrophic system failures (such as Rimrock outlet works, spillway releases, and operating gates on all reservoirs during flip-flop).

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
IRRIGATION 6.6 - continued		
Flood control operation concerns. Overuse of flood control operation may result in failure to fill.	1. Obtain improved runoff forecasts that would benefit TWSA & flood control predictions. 2. Accept more risk in the springtime operations. Change flood control guidelines. Instead of 12,000 cfs, protect Parker at 15,000 or 16,000 cfs. This alternative involves building new flood control guidelines. 3. Establish a flood corridor that will not be encroached on by development. (Needs cooperation from others.) 4. Perform a flood control/flood storage analysis to investigate reducing flood storage space, particularly in the spring, to allow earlier storage reservoir fill operations. Revise flood control curves to implement the analysis.	82 Analyze flood control/flood storage and based on the analysis, begin fill operations earlier in the year, shifting operations to bypass inflow once the reservoirs are filled. 83 **Work with Reclamation, Corps, FEMA, and counties in establishing a flood corridor that will not be encroached on by future development.**
Recreation operation concerns.	1. Continue to consider drafting Clear Lake in critical water supply years (timing may be critical).	84 **Continue to consider drafting Clear Lake in critical water supply years. Timing is critical**.
Wapatox power operation concerns.	1. Fully implement court orders pertaining to use of storage water. 2. Implement studies to determine flow needed to benefit reach. Then perform a partial buyout or full buyout of Wapatox Power Plant as necessary.	85 **Implement studies to determine flow needed to benefit reach. Then perform a partial buyout or full buyout of Wapatox Power Plant as necessary.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
HYDROELECTRIC POWER 6.7		
Provide water for existing power generation facilities.	1. Continue to coincidentally generate power at existing facilities and subordinate power production as necessary to reduce environmental impacts. 2. Change time of releases to support power production.	86 **Continue to operate existing facilities, subordinating as necessary to minimize or avoid environmental impacts.** 87 **Continue to refine subordinations criteria.**
Provide water, data or support for new power generation facilities.	1. Explore additional coincidental power production only where it would not hinder achieving other water management (or resource) objectives.	88 **Develop new facilities only where it would not hinder achieving other water management (or resource) objectives.**

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
<u>FLOOD DAMAGE REDUCTION 6.8</u>		
Effects timing of peak events and depending on the event and space available, can decrease the magnitude of flood events.	1. Get improved forecasts and use them with an early warning system to reduce flood damage. 2. Establish a flood corridor that will not be encroached on by development. (Needs cooperation from others.) 3. Perform a flood control/flood storage analysis to investigate reducing flood storage space, particularly in the spring, to allow earlier storage reservoir fill operations. Revise flood control curves to implement the analysis. 4. Meet with the Corps, FEMA, and county government to encourage them to implement non-structural flood control alternatives in the Yakima basin. 5. Match flood prone areas with high priority wetland and floodplain habitat areas, and prioritize for acquisition or other protective status such as conservation easements that would allow periodic flooding. 6. After the establishment of a flood corridor, fund, through this partnership, using existing Reclamation, Corps, FEMA, and other available Federal and State authorities and authorizations, the relocation or flood proofing of homes and businesses (e.g., gravel mining), removal of flood control structures, and acquisition of title or conservation easements for priority lands.	89 Analyze flood control/flood storage and based on the analysis, begin fill operations earlier in the year, shifting operations to bypass inflow once the reservoirs are filled. 90 **Meet with the Corps, FEMA, and county governments to encourage them to implement non-structural flood control alternatives in the Yakima basin.** 91 **Request Corps and FEMA to update the 100-year floodplain maps using recent flood information.** 92 Work with Reclamation, Corps, FEMA, and counties in establishing a flood corridor that will not be encroached on by future development. 93 Match flood prone areas with high priority wetland and floodplain habitat areas and prioritize for acquisition or other protective status such as conservation easements that would allow periodic flooding.

Project Effects - Section 6	Alternatives - Section 8	Recommendations - Section 9
FLOOD DAMAGE REDUCTION 6.8 - continued		
		94 **Through the partnership and using existing Reclamation, Corps, FEMA, and other available Federal, State, and local authorities, authorizations, appropriations, and other funding vehicles, fund the relocation or flood proofing of homes and businesses, removal of flood control structures, and acquisition of title or conservation easements for priority lands.**

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WAC 173-201A-030 - General water use and criteria classes. The following criteria shall apply to the various classes of surface waters in the state of Washington:

(1) **Class AA (extraordinary).**

(a) General characteristic. Water quality of this class shall markedly and uniformly exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 9.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 7.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 7.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 16.0 °C (freshwater) or 13.0 °C (marine water) due to human activities. When natural conditions exceed 16.0 °C (freshwater) and 13.0 °C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed $t=23/(T+5)$ (freshwater) or $t=8/(T-4)$ (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8 °C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.2 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(2) **Class A (excellent).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing, spawning, and harvesting.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 14 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 43 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 8.0 mg/L.

(B) Marine water - dissolved oxygen shall exceed 6.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 6.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 18.0 °C (freshwater) or 16.0 °C (marine water) due to human activities. When natural conditions exceed 18.0 °C (freshwater) and 16.0 °C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed t=28/(T+7) (freshwater) or t=12/(T-2) (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8 °C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(3) **Class B (good).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial and agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam, oyster, and mussel rearing and spawning.

Crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organisms:

(A) Freshwater - fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(B) Marine water - fecal coliform organism levels shall both not exceed a geometric mean value of 100 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 200 colonies/100 mL.

(ii) Dissolved oxygen:

(A) Freshwater - dissolved oxygen shall exceed 6.5 mg/L.

(B) Marine water - dissolved oxygen shall exceed 5.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 5.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature shall not exceed 21.0 °C (freshwater) or 19.0 °C (marine water) due to human activities. When natural conditions exceed 21.0 °C (freshwater) and 19.0 °C (marine water), no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C.

Incremental temperature increases resulting from point source activities shall not, at any time, exceed $t=34/(T+9)$ (freshwater) or $t=16/(T)$ (marine water). Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8 °C.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) and 7.0 to 8.5 (marine water) with a human-caused variation within the above range of less than 0.5 units.

(vi) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be reduced by dissolved, suspended, floating, or submerged matter not attributed to natural causes, so as to affect water use or taint the flesh of edible species.

(4) **Class C (fair).**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements of selected and essential uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (industrial).

(ii) Fish (salmonid and other fish migration).

(iii) Recreation (secondary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(iv) Commerce and navigation.

(c) Water quality criteria - marine water:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 200 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 400 colonies/100 mL.

(ii) Dissolved oxygen shall exceed 4.0 mg/L. When natural conditions, such as upwelling, occur, causing the dissolved oxygen to be depressed near or below 4.0 mg/L, natural dissolved oxygen levels may be degraded by up to 0.2 mg/L by human-caused activities.

(iii) Temperature shall not exceed 22.0 °C due to human activities. When natural conditions exceed 22.0 °C, no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3 °C.

Incremental temperature increases shall not, at any time, exceed $T=20/(T+2)$.

For purposes hereof, "t" represents the maximum permissible temperature increase measured at a mixing zone boundary; and "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

(iv) pH shall be within the range of 6.5 to 9.0 with a human-caused variation within a range of less than 0.5 units.

(v) Turbidity shall not exceed 10 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 20 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vi) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(vii) Aesthetic values shall not be interfered with by the presence of obnoxious wastes, slimes, aquatic growths, or materials which will taint the flesh of edible species.

(5) **Lake Class.**

(a) General characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic uses. Characteristic uses shall include, but not be limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Stock watering.

(iii) Fish and shellfish:

Salmonid migration, rearing, spawning, and harvesting.

Other fish migration, rearing, spawning, and harvesting.

Clam and mussel rearing, spawning, and harvesting.

Crayfish rearing, spawning, and harvesting.

(iv) Wildlife habitat.

(v) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).

(vi) Commerce and navigation.

(c) Water quality criteria:

(i) Fecal coliform organism levels shall both not exceed a geometric mean value of 50 colonies/100 mL, and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100 colonies/100 mL.

(ii) Dissolved oxygen - no measurable decrease from natural conditions.

(iii) Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature - no measurable change from natural conditions.

(v) pH - no measurable change from natural conditions.

(vi) Turbidity shall not exceed 5 NTU over background conditions.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department (see WAC 173-201A-040 and 173-201A-050).

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(6) **Establishing lake nutrient criteria.**

(a) The following table shall be used to aid in establishing nutrient criteria:

(Table 1) The ecoregional and trophic state action values for establishing nutrient criteria:

Coast Range, Puget Lowlands, and Norther Rockies Ecoregions:		
Trophic State	If Ambient TP (mg/l) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
	Action value	
	>20.....	lake specific study may be initiated.
Cascades Ecoregion:		
Trophic State	If Ambient TP (mg/l) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
	Action value	
	>10.....	lake specific study may be initiated.
Columbia Basin Ecoregion:		
Trophic State	If Ambient TP (mg/l) Range of Lake is:	Then criteria should be set at:
Ultra-oligotrophic	0-4	4 or less
Oligotrophic	>4-10	10 or less
Lower mesotrophic	>10-20	20 or less
	>20-35	35 or less
Upper mesotrophic	Action value	
	>35.....	lake specific study may be initiated.

Lakes in the Willamette, East Cascade Foothills, or Blue Mountain ecoregions do not have recommended values and need to have lake-specific studies in order to receive criteria as described in (c)(i) of this subsection.

(b) The following actions are recommended if ambient monitoring of a lake shows the epilimnetic total phosphorus concentration, as shown in Table 1 of this section, is below the action value for an ecoregion:

(i) Determine trophic status from existing or newly gathered data. The recommended minimum sampling to determine trophic status is calculated as the mean of four or more samples

collected from the epilimnion between June through September in one or more consecutive years. Sampling must be spread throughout the season.

(ii) Propose criteria at or below the upper limit of the trophic state; or

(iii) Conduct lake-specific study to determine and propose to adopt appropriate criteria as described in (c) of this subsection.

(c) The following actions are recommended if ambient monitoring of a lake shows total phosphorus to exceed the action value for an ecoregion shown in Table 1 of this section or where recommended ecoregional action values do not exist:

(i) Conduct a lake-specific study to evaluate the characteristic uses of the lake. A lake-specific study may vary depending on the source or threat of impairment. Phytoplankton blooms, toxic phytoplankton, or excessive aquatic plants, are examples of various sources of impairment. The following are examples of quantitative measures that a study may describe: Total phosphorus, total nitrogen, chlorophyll-a, dissolved oxygen in the hypolimnion if thermally stratified, pH, hardness, or other measures of existing conditions and potential changes in any one of these parameters.

(ii) Determine appropriate total phosphorus concentrations or other nutrient criteria to protect characteristic lake uses. If the existing total phosphorus concentration is protective of characteristic lake uses, then set criteria at existing total phosphorus concentration. If the existing total phosphorus concentration is not protective of the existing characteristic lake uses, then set criteria at a protective concentration. Proposals to adopt appropriate total phosphorus criteria to protect characteristic uses must be developed by considering technical information and stakeholder input as part of a public involvement process equivalent to the Administrative Procedure Act (chapter 34.05 RCW).

(iii) Determine if the proposed total phosphorus criteria necessary to protect characteristic uses is achievable. If the recommended criterion is not achievable and if the characteristic use the criterion is intended to protect is not an existing use, then a higher criterion may be proposed in conformance with 40 CFR part 131.10.

(d) The department will consider proposed lake-specific nutrient criteria during any water quality standards rule making that follows development of a proposal. Adoption by rule formally establishes the criteria for that lake.

(e) Prioritization and investigation of lakes by the department will be initiated by listing problem lakes in a watershed needs assessment, and scheduled as part of the water quality program's watershed approach to pollution control. This prioritization will apply to lakes identified as warranting a criteria based on the results of a lake-specific study, to lakes warranting a lake-specific study for establishing criteria, and to lakes requiring restoration and pollution control measures due to exceedance of an established criterion. The adoption of nutrient criteria are generally not intended to apply to lakes or ponds with a surface area smaller than five acres; or to ponds wholly contained on private property owned and surrounded by a single landowner; and nutrients do not drain or leach from these lakes or private ponds to the detriment of other property owners or other water bodies; and do not impact designated uses in the lake. However, if the landowner proposes criteria the department may consider adoption.

(f) The department may not need to set a lake-specific criteria or further investigate a lake if existing water quality conditions are naturally poorer (higher TP) than the action value and uses have not been lost or degraded, per WAC 173-201A-070(2).

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-030, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-030, filed 11/25/92, effective 12/26/92.]

APPENDIX A-2

SECTION 303(d) 1998 LIST

WATERBODY SEGMENT NUMBER[1]	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-37-1010	Yakima River	4,4'-DDD, 4,4'-DDE, Arsenic, Cadmium, Copper, DDT, Dieldrin, Dissolved Oxygen, Endosulfan, Fecal Coliform, Instream Flow, Mercury, PCB-1254, PCB-1260, pH, Temperature, Turbidity
WA-37-1012	Snipes Creek	Dieldrin, Dissolved Oxygen, Temperature, DDT
WA-38-1014	Spring Creek	DDT, DDD, DDE
WA-37-1020	Yakima River	4,4'-DDE, Ammonia-N, Chlorine, DDT, Dieldrin, Instream Flow, Temperature
WA-37-1024	Granger Drain	4,4'-DDD, 4,4'-DDE, Ammonia-N, DDT, Dieldrin, Dissolved Oxygen, Endosulfan, Fecal Coliform, pH, Temperature
WA-37-1025	Marion Drain	On Yakama Nation lands and is not under State's jurisdiction
WA-37-1030	Sulphur Creek Wasteway	4,4'-DDD, 4,4'-DDE, Arsenic, DDT, Dieldrin, Endosulfan, Mercury, Silver, Temperature
WA-37-1035	Satus Creek	On Yakama Nation lands and is not under State's jurisdiction
WA-37-1040	Yakima River	Ammonia-N, Chlorine, Fecal Coliform, Mercury, Silver
WA-37-1047	Wide Hollow Creek	4,4'-DDD, 4,4'-DDE, DDT, Dieldrin, Dissolved Oxygen, Endosulfan, Fecal Coliform, Temperature
WA-37-1048	Moxee (Birchfield) Drain	4,4'-DDD, 4,4'-DDE, Chlorpyrifos, DDT, Dieldrin, Dissolved Oxygen, Endosulfan, Fecal Coliform, Malathion, pH, Temperature
WA-37-1050	Toppenish Creek	On Yakama Nation lands and is not under State's jurisdiction
WA-37-2000	Ahtanum Creek	
WA-37-2105	Spring Creek	Temperature
WA-37-9030	Giffin Lake	Total Phosphorus

APPENDIX A-2

SECTION 303(d) 1998 LIST

WATERBODY SEGMENT NUMBER[1]	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-38-1010	Naches River	pH, Silver, Temperature
WA-38-1015	Cowiche Creek	Fecal Coliform, Instream Flow, Temperature
WA-38-1016	Cowiche Creek, N.F.	Fecal Coliform, Temperature
WA-38-1017	Cowiche Creek, S.F.	Fecal Coliform, Temperature
WA-38-1018	Reynolds Creek	Temperature
WA-38-1020	Tieton River	
WA-38-1035	Rattlesnake Creek	Temperature
WA-38-1036	Little Rattlesnake Creek	Temperature
WA-38-1037	Rattlesnake Creek	Temperature
WA-38-1041	Gold Creek	Temperature
WA-38-1060	American River	Temperature
WA-38-1070	Bumping River	Temperature
WA-38-1080	Little Naches River	Temperature
WA-38-1081	Crow Creek	Temperature
WA-38-1086	Mathew Creek	Temperature
WA-38-1088	Bear Creek	Temperature
WA-38-1091	Blowout Creek	Temperature
WA-38-2110	Nile Creek, N.F.	Temperature
WA-38-3000	Tieton River, S.F.	Temperature
WA-38-9080	Myron Lake	Ammonia-N

SECTION 303(d) 1998 LIST

WATERBODY SEGMENT NUMBER[1]	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-39-1010	Yakima River	4,4'-DDE, DDT, Dieldrin, Silver
WA-39-1012	Wenas Creek	Instream Flow
WA-39-1020	Wilson Creek	Temperature, Fecal Coliform
WA-39-1025	Naneum Creek	Temperature
WA-39-1030	Yakima River	4,4'-DDE, Ammonia-N, Cadmium, Copper, DDT, Mercury
WA-39-1032	Cherry Creek	Temperature, DDT, 4,4'-DDE, Dieldrin
WA-39-1034	Cooke Creek	Dissolved Oxygen, Temperature, Fecal Coliform
WA-39-1037	Crystal Creek	pH
WA-39-1050	Cle Elum River	Temperature
WA-39-1051	French Cabin Creek	
WA-39-1053	Thorp Creek	Temperature
WA-39-1055	Cooper River	Temperature
WA-39-1057	Waptus River	Temperature
WA-39-1060	Yakima River	Temperature, Dissolved Oxygen
WA-39-1070	Yakima River	Temperature
WA-39-1073	Big Creek	Temperature, Instream Flow
WA-39-1075	Cabin Creek	Temperature
WA-39-1077	Log Creek	Temperature
WA-39-1110	Selah Ditch	Ammonia-N, Chlorine, Dissolved Oxygen
WA-39-1300	Gale Creek	Temperature
WA-39-1350	Meadow Creek	Temperature
WA-39-1390	Gold Creek	Temperature
WA-39-1400	Swauk Creek	Temperature
WA-39-1425	Williams Creek	Temperature
WA-39-1435	Blue Creek	Temperature

SECTION 303(d) 1998 LIST

WATERBODY SEGMENT NUMBER[1]	WATERBODY NAME	PARAMETERS EXCEEDING STANDARDS
WA-39-1440	Iron Creek	Temperature
WA-39-1500	Taneum Creek	Instream Flow
WA-39-1520	Taneum Creek	Temperature
WA-39-1558	Lookout Creek	Temperature
WA-39-1570	Taneum Creek, S.F.	Temperature
WA-39-2000	Teanaway River	Instream Flow, Temperature
WA-39-2100	Teanaway River, N.F.	Temperature
WA-39-2150	Teanaway River, N.F.	Temperature
WA-39-2155	Stafford Creek	Temperature
WA-39-2200	Teanaway River, M.F.	Temperature
WA-39-2250	Teanaway River, M.F.	Temperature
WA-39-2300	Teanaway River, W.F.	Temperature
WA-39-2350	Teanaway River, W.F.	Temperature
WA-39-3000	Manastash Creek	Instream Flow
WA-39-3020	Manastash Creek, S.F.	Temperature
WA-39-3025	Manastash Creek, S.F.	Temperature

[1] See pages 5-8

STATE OF WASHINGTON
WATERBODY SEGMENT IDENTIFICATION LIST

SEGMENT NUMBER	WATERBODY NAME	SEGMENT DESCRIPTION
WA-37-1010	YAKIMA RIVER	MOUTH AT COLUMBIA (RM 335.2) TO TOPPENISH CREEK (RM 80.4). (RM 59.8 TO TOP OF SEGMENT IS PARTIALLY UNDER THE JURISDICTION OF THE YAKAMA NATION)
WA-37-1012	SNIPES CREEK	MOUTH AT YAKIMA (RM 41.8 DOWNSTREAM OF PROSSER) TO HEADWATERS
WA-37-1014	SPRING CREEK	MOUTH AT YAKIMA (RM 41.8) TO HEADWATERS
WA-37-1020	YAKIMA RIVER	TOPPENISH CREEK (RM 80.4) TO SUNNYSIDE DAM BRIDGE (RM 103.8). (THIS ENTIRE SEGMENT IS PARTIALLY UNDER THE JURISDICTION OF THE YAKAMA NATION)
WA-37-1024	GRANGER DRAIN	MOUTH AT YAKIMA (RM 83 AT GRANGER) TO HEADWATERS
WA-37-1025	MARION DRAIN	MOUTH AT YAKIMA (RM 82.9 NEAR GRANGER) TO HEADWATERS NEAR LABBEE AIRPORT. (THE SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKIMA NATION)
WA-37-1030	SULPHUR CREEK	MOUTH AT YAKIMA (RM 61.0) TO WASTEWAY HEADWATERS
WA-37-1035	SATUS CREEK	MOUTH AT YAKIMA (RM 69.6) TO DEADWATERS. (THE SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKIMA NATION)
WA-37-1040	YAKIMA RIVER	SUNNYSIDE DAM BRIDGE (RM 103.8) TO NACHES RIVER (RM 116.3). (THE SEGMENT FROM RM 103.8 TO 106.9 IS PARTIALLY UNDER THE JURISDICTION OF THE YAKIMA NATION)
WA-37-1047	WIDE HOLLOW CREEK	MOUTH AT YAKIMA (RM 104.7) TO HEADWATERS
WA-37-1048	MOXEE (BIRCHFIELD) DRAIN	MOUTH AT YAKIMA (RM 107.6 NEAR UNION GAP) TO HEADWATERS ALONG BIRCHFIELD ROAD
WA-37-1050	TOPPENISH CREEK	MOUTH AT YAKIMA (RM 80.4 SOUTH OF GRANGER) TO HEADWATERS. (THE SEGMENT IS ENTIRELY UNDER THE JURISDICTION OF THE YAKIMA NATION)
WA-37-2000	AHTANUM CREEK	MOUTH AT YAKIMA (RM 106.9) TO CONFLUENCE OF N.F. AND S.F. (RM 23.1). (THE SEGMENT IS PARTIALLY UNDER THE JURISDICTION OF THE YAKIMA NATION)
WA-37-2105	SPRING CREEK	MOUTH AT BACHELOR CREEK (RM 2.0 NEAR HATCHERY) TO HEADWATERS
WA-37-9030	GIFFIN LAKE	LAT/LONG = 461439/1210148 TRS = 09N-22E-23 ELEV = 0 FT MEAN DEPTH - 4 FT MAX DEPTH = 7FT VOLUME = 377 AF
WA-38-1010	NACHES RIVER	MOUTH AT YAKIMA (RM 116.3) TO TIETON RIVER (RM 17.5)
WA-38-1015	COWICHE CREEK	MOUTH AT NACHES (RM 2.7) TO HEADWATERS (INCLUDES BOTH N.F. (19.1 MILES) AND S.F. (22.2 MILES))

STATE OF WASHINGTON
WATERBODY SEGMENT IDENTIFICATION LIST

SEGMENT NUMBER	WATERBODY NAME	SEGMENT DESCRIPTION
WA-38-1016	COWICHE CREEK, N.F.	MOUTH AT COWICHE CREEK (RM 7.5) TO HEADWATERS
WA-38-1017	COWICHE CREEK, S.F.	MOUTH AT COWICHE CREEK (RM 7.5) TO HEADWATERS
WA-38-1018	REYNOLDS CREEK	MOUTH AT S.F. COWICHE (RM 11.8) TO HEADWATERS ON STORBACH MOUNTAIN
WA-38-1020	TIETON RIVER	MOUTH AT NACHES (RM 17.5) TO RIMROCK LAKE DAM
WA-38-1035	RATTLESNAKE CREEK	MOUTH AT NACHES (RM 27.8) TO NATIONAL FOREST BOUNDARY (RM 1.2)
WA-38-1036	LITTLE RATTLESNAKE CREEK	MOUTH AT RATTLESNAKE CREEK (RM 1.1) TO NATIONAL FOREST BOUNDARY (RM 5.0)
WA-38-1037	RATTLESNAKE CREEK	NATIONAL FOREST BOUNDARY (RM 1.2) TO HEADWATERS
WA-38-1041	GOLD CREEK	MOUTH AT NACHES (RM 38.2) TO HEADWATERS, INCLUDES N.F. (RM 3.0)
WA-38-1060	AMERICAN RIVER	MOUTH AT BUMPING (RM 3.5) TO HEADWATERS
WA-38-1070	BUMPING RIVER	AMERICAN R. (RM 3.5) TO BUMPING LAKE DAM (RM 17.0)
WA-38-1080	LITTLE NACHES RIVER	MOUTH AT NACHES (RM 44.6) TO CONFLUENCE OF M.F. AND N.F. (RM 13.2)
WA-38-1081	CROW CREEK	MOUTH AT LITTLE NACHES (RM 3.2) TO HEADWATERS NEAR HAYDEN PASS
WA-38-1086	MATHEW CREEK	MOUTH AT LITTLE NACHES (RM 9.5) TO HEADWATERS
WA-38-1088	BEAR CREEK	MOUTH AT LITTLE NACHES (RM 10.9) TO HEADWATERS
WA-38-1091	BLOWOUT CREEK	MOUTH AT N.F. LITTLE NACHES (RM 0.6) TO HEADWATERS
WA-38-2110	NILE CREEK, N.F.	MOUTH AT NILE CREEK (RM 4.0) TO HEADWATERS
WA-38-3000	TIETON RIVER, S.F.	MOUTH AT RIMROCK LAKE TO HEADWATERS NEAR GILBERT PEAK
WA-38-9080	MYRON LAKE	ALONG HIGHWAY 12 IN NORTH YAKIMA, TRS = 13N-18E-10, MEAN DEPTH = 9.1 METERS, MAX DEPTH - 13.9 METERS
WA-39-1010	YAKIMA RIVER	NACHES RIVER (RM 116.3) TO WILSON CREEK (RM 147.0)
WA-39-1012	WENAS CREEK	MOUTH AT YAKIMA (RM 122.4) TO OUTLET OF WENAS LAKE
WA-39-1020	WILSON CREEK	MOUTH AT YAKIMA (RM 147.0) TO HEADWATERS
WA-39-1025	NANEUM CREEK	MOUTH AT WILSON CREEK (RM 20.0) TO HEADWATERS AT HANEY MEADOW
WA-39-1030	YAKIMA RIVER	WILSON CREEK (RM 147.0) TO CLE ELUM RIVER (RM 185.6)

STATE OF WASHINGTON
WATERBODY SEGMENT IDENTIFICATION LIST

SEGMENT NUMBER	WATERBODY NAME	SEGMENT DESCRIPTION
WA-39-1032	CHERRY CREEK	MOUTH AT WILSON CREEK (RM 1.1 AT THRALL) TO HEADWATERS
WA-39-1034	COOKE CREEK	MOUTH AT CHERRY CREEK (RM 3.0) TO HEADWATERS
WA-39-1037	CRYSTAL CREEK	MOUTH AT YAKIMA (RM 183.1) TO CONFLUENCE OF WEST FORK AND MIDDLE FORK (RM 3.0)
WA-39-1050	CLE ELUM RIVER	CLE ELUM LAKE (RM 15.9) TO OUTLET OF HYAS LAKE
WA-39-1051	FRENCH CABIN CREEK	MOUTH AT CLE ELUM (RM 15.9) TO HEADWATERS NEAR SOUTH PEAK
WA-39-1053	THORP CREEK	MOUTH AT CLE ELUM (RM 17.2) TO OUTLET OF THORP LAKE
WA-39-1055	COOPER RIVER	MOUTH AT CLE ELUM (RM 19.2) TO HEADWATERS AT CHIMNEY ROCK
WA-39-1057	WAPTUS RIVER	MOUTH AT CLE ELUM (RM 21.5) TO OUTLET OF IVANHOE LAKE
WA-39-1060	YAKIMA RIVER	CLE ELUM RIVER (RM 185.6) TO LAKE EASTON DAM (RM 202.5)
WA-39-1070	YAKIMA RIVER	LAKE EASTON DAM (RM 202.5) TO KEECHELUS DAM (RM 214.5)
WA-39-1073	BIG CREEK	MOUTH AT YAKIMA (RM 195.8) TO HEADWATERS
WA-39-1075	CABIN CREEK	MOUTH AT YAKIMA (RM 205.0) TO HEADWATERS
WA-39-1077	LOG CREEK	MOUTH AT CABIN CREEK (RM 5.3) TO HEADWATERS NEAR BLOWOUT MOUNTAIN
WA-39-1110	SELAH DITCH	MOUTH AT GOLF CLUB CREEK (RM 0.1) TO HEADWATERS NEAR SELAH
WA-39-1300	GALE CREEK	MOUTH AT KACHEES LAKE TO OUTFLOW FROM SWAN LAKE
WA-39-1350	MEADOW CREEK	MOUTH AT KEECHELUS LAKE TO HEADWATERS NEAR MEADOW MOUNTAIN
WA-39-1390	GOLD CREEK	MOUTH AT KEECHELUS LAKE TO HEADWATERS NEAR CHIKAMIN PEAK
WA-39-1400	SWAUK CREEK	MOUTH AT YAKIMA (RM 169.9) TO NATIONAL FOREST BOUNDARY (RM 9.1)
WA-39-1420	SWAUK CREEK	NATIONAL FOREST BOUNDARY (RM 9.1) TO HEADWATERS
WA-39-1425	WILLIAMS CREEK	MOUTH AT SWAUK CREEK (RM 11.0) TO HEADWATERS
WA-39-1435	BLUE CREEK	MOUTH AT SWAUK CREEK (RM 15.1) TO HEADWATERS
WA-39-1440	IRON CREEK	MOUTH AT SWAUK CREEK (RM 17.3) TO HEADWATERS

STATE OF WASHINGTON
WATERBODY SEGMENT IDENTIFICATION LIST

SEGMENT NUMBER	WATERBODY NAME	SEGMENT DESCRIPTION
WA-39-1500	TANEUM CREEK N.F.	MOUTH AT YAKIMA (RM 166.1) TO NATIONAL FOREST BOUNDARY (RM 8.2)
WA-39-1520	TANEUM CREEK	NATIONAL FOREST BOUNDARY (RM 8.2) TO CONFLUENCE OF N.F. AND S.F. (RM 12.7)
WA-39-1558	LOOKOUT CREEK	MOUTH AT N.F. TANEUM CREEK (RM 8.5) TO HEADWATERS
WA-39-1570	TANEUM CREEK, S.F.	MOUTH AT TANEUM CREEK (RM 12.7 CONFLUENCE WITH N.F.) TO HEADWATERS
WA-39-2000	TEANAWAY RIVER	MOUTH AT YAKIMA (RM 176.1) TO N.F. TEANAWAY RIVER (RM 10.6)
WA-39-2100	TEANAWAY RIVER, N.F.	MOUTH AT TEANAWAY (RM 10.6) TO NATIONAL FOREST BOUNDARY (RM 7.0)
WA-39-2150	TEANAWAY RIVER, N.F.	NATIONAL FOREST BOUNDARY (RM 7.0) TO HEADWATERS
WA-39-2155	STAFFORD CREEK	MOUTH AT N.F. TEANAWAY (RM 8.3) TO HEADWATERS
WA-39-2200	TEANAWAY RIVER, M.F.	MOUTH AT TEANAWAY (RM 11.7 CONFLUENCE WITH W.F.) TO NATIONAL FOREST BOUNDARY (RM 5.0)
WA-39-2250	TEANAWAY RIVER, M.F.	NATIONAL FOREST BOUNDARY (RM 5.0) TO HEADWATERS
WA-39-2300	TEANAWAY RIVER, W.F.	MOUTH AT TEANAWAY (RM 11.7 CONFLUENCE WITH M.F.) TO NATIONAL FOREST BOUNDARY (RM 6.6)
WA-39-2350	TEANAWAY RIVER, W.F.	NATIONAL FOREST BOUNDARY (RM 6.6) TO HEADWATERS
WA-39-3000	MANASTASH CREEK	MOUTH AT YAKIMA (RM 154.5) TO CONFLUENCE OF N.F. AND S.F. (RM 8.5)
WA-39-3020	MANASTASH CREEK, S.F.	MOUTH AT MANASTASH (RM 8.5 CONFLUENCE WITH N.F.) TO WENATCHEE NATIONAL FOREST BOUNDARY
WA-39-3025	MANASTASH CREEK, S.F.	WENATCHEE NATIONAL FOREST BOUNDARY TO HEADWATERS

SPRING CHINOOK

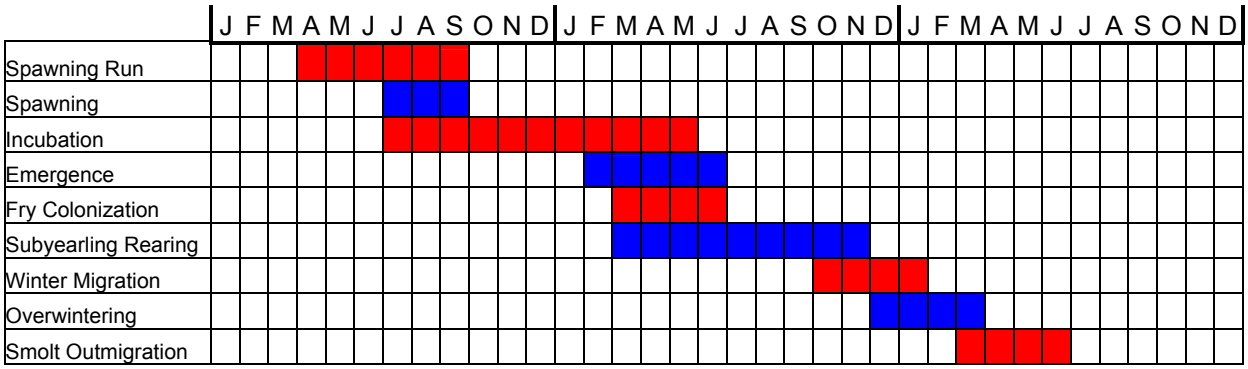

Figure 1. Mean timing of successive freshwater life stages of Yakima Basin spring chinook

SPRING CHINOOK

Table 1. Annual basin-wide smolt and adult productivity of Yakima Basin spring chinook

BROOD YEAR	SMOLT YEAR	SMOLTS[a]	SMOLTS PER SPAWNER	SMOLT TO ADULT SURVIVAL[b]	ADULT RECRUITMENT RATE[b]
1981	1983	245,921	201	2.5%	5.1
1982	1984	365,755	256	2.1%	5.4
1983	1985	140,755	104	3.3%	3.4
1984	1986	218,321	96	1.7%	1.6
1985	1987	252,165	70	1.8%	1.2
1986	1988	260,932	33	1.7%	0.6
1987	1989	72,460	19	3.3%	0.6
1988	1990	134,162	44	4.2%	1.8
1989	1991	104,405	26	2.6%	0.7
1990	1992	123,041	34	1.0%	0.3
1991	1993	87,844	31	0.6%	0.2
1992	1994	162,989	38	2.2%	0.8
1993	1995	168,471	44	2.0%	0.9
1994	1996	207,365	181	0.8%	1.4
1995	1997	49,524	84	3.4%	2.9
1996	1998	278,706	103	8.4%	8.7
1997	1999	291,982	135		
1998	2000	84,821	71		

a. Estimated as the sum of "spring smolts", counted from March 1 through the end of the outmigration, and one half of the "winter migrants" – subyearlings passing Prosser the winter preceding the spring of outmigration.

b. Figures for brood year '96 estimated: the historical proportion of age-5 to age-4 returns was assumed.

Information is from: Fast, D. 2001. Draft Yakima Subbasin Summary. August 3, 2001. Prepared for the Northwest Power Planning Council. Laura Berg, editor. Available at: http://ykfp.org/publications/index.htm

FALL CHINOOK

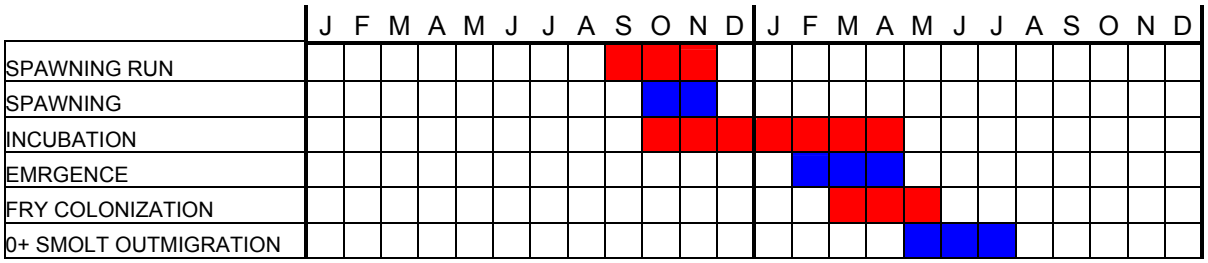

Figure 2. Mean timing of successive freshwater life stages of Yakima Basin fall Chinook

FALL CHINOOK

Table 2. Estimated natural production productivity parameters for the combined mainstem and Marion Drain Yakima fall chinook population spawning above Prosser Dam, 1983 – 2000

YEAR	WILD SMOLTS	ALL WILD SPAWNERS	SMOLT-TO-ADULT SURVIVAL	SMOLTS PER SPAWNER	ADULT RECRUITMENT RATE	MEAN TEMP (°F)[a]
1983	103,521	380	0.58%		1.34	
1984	43,586	1331	1.17%	115	0.49	
1985	68,181	273	0.96%	**51**	1.39	
1986	33,380	731	1.14%	122	0.97	
1987	154,307	486	0.46%	210	2.23	69.7
1988	76,205	220	1.42%	142	6.35	69.5
1989	27,841	576	5.01%	120	1.74	67.6
1990	110,792	1161	0.91%	165	0.96	68.2
1991	55,083	823	2.03%	**37**	1.41	65.9
1992	253,455	1442	0.46%	261	0.83	74.2
1993	148,709	855	0.81%	92	1.34	69.0
1994	195,613	976	0.59%	184	1.20	72.3
1995	33,386	1241	3.51%	**22**	1.33	65.7
1996	6,512	1190		**5**		64.3
1997	35,578	992	5.02%	**26**		59.7
1998	406,814	1081		363		67.6
1999	45,702	1880		**40**		61.7
2000	175,912	1980		93		69.5
MEAN	**109,699**	**979**	**1.72%**	**120**	**1.66**	**67.5**

Mean water temperature at Prosser Dam over the period June 15 – July 15. A continuous thermal record of Prosser water temperature does not exist prior to 1987.

Information is from: Fast, D. 2001. Draft Yakima Subbasin Summary. August 3, 2001. Prepared for the Northwest Power Planning Council. Laura Berg, editor. Available at: http://ykfp.org/publications/index.htm

STEELHEAD

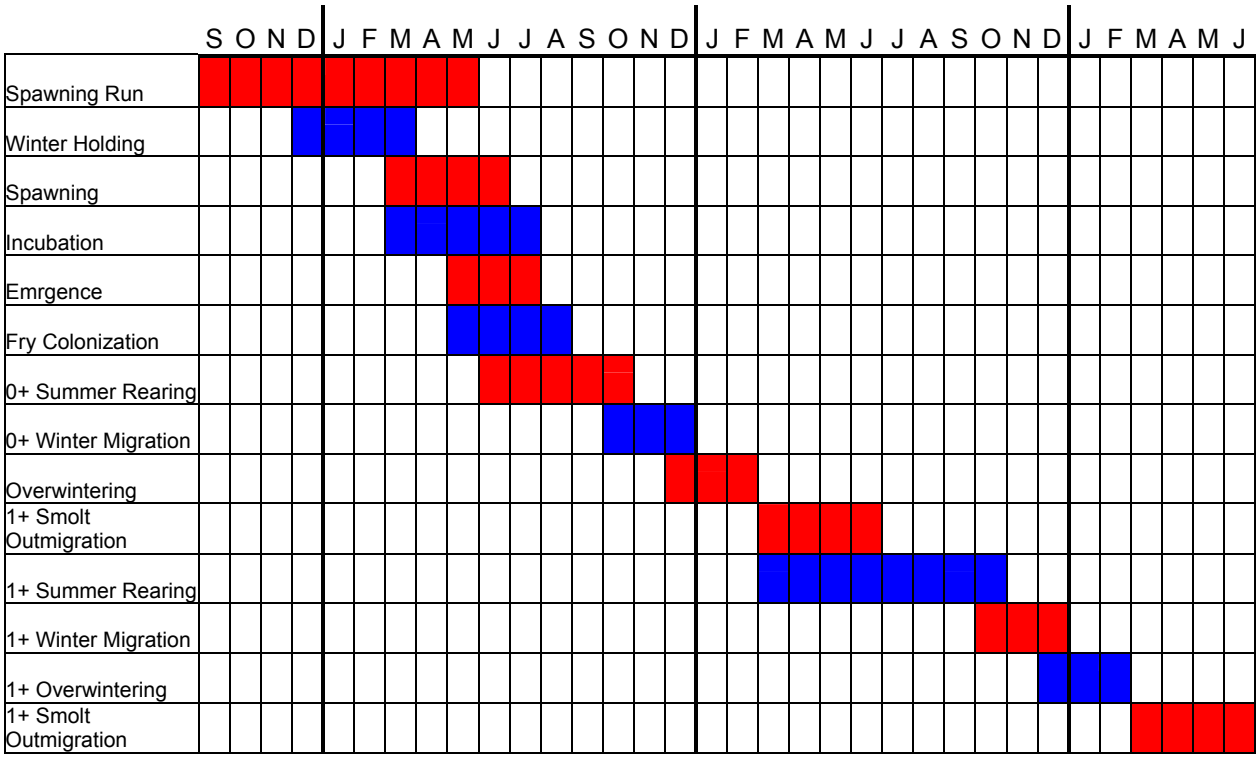

Figure 3. General duration of successive life stages in for Yakima Basin summer steelhead (all stocks)

Information is from: Fast, D. 2001. Draft Yakima Subbasin Summary. August 3, 2001. Prepared for the Northwest Power Planning Council. Laura Berg, editor. Available at: http://ykfp.org/publications/index.htm

STEELHEAD

Table 3. Steelhead smolt production, adult return and spawning escapement, smolts/returnees and returnees/smolt estimates

Year	Total Smolts	Adult Return			Wild Adults from Smolts Yr X	Brood Year Escapement (Wild + Hatch)	Smolts from Brood Year Escapement	Smolt to Adult Survival	Smolts per Spawner	Adult Recruitment Rate
		Hatchery	Wild	Total						
1983	81,640	N.D.	N.D.	N.D.	1,818			2.23%		
1984	97,920	N.D.	N.D.	N.D.	2,987			3.05%		
1985	65,735	0	2,194	2194	2,249	689	107,329	3.42%	155.78	1.44
1986	120,591	0	2,235	2235	1,858	1408	101,232	1.54%	71.90	0.67
1987	109,934	0	2,465	2465	879	1822	39,168	0.80%	21.50	0.42
1988	70,961	239	2,601	2840	925	2496	31,330	1.30%	12.55	0.75
1989	26,620	96	1,066	1162	1,040	864	22,654	3.91%	26.22	1.06
1990	23,075	87	727	814	1,697	539	31,169	7.36%	57.83	1.28
1991	22,983	104	730	834	845	782	20,054	3.68%	25.64	0.84
1992	36,225	251	2,014	2265	661	2095	16,824	1.82%	8.03	0.31
1993	17,339	80	1,104	1184	657	1089	20,017	3.79%	18.38	0.78
1994	18,738	14	540	554	630	551	30,115	3.36%	54.66	1.79
1995	17,715	98	820	918	881	918	63,729	4.98%	69.42	1.29
1996	45,814	54	451	505	996	485	108,036	2.17%	222.76	
1997	69,450	145	816	961	1,215	961	91,962	1.75%	95.69	
1998	117,765	165	948	1113		1,113	36,697		32.97	
1999	70,293	52	1,018	1070		1,070				
2000	41,361	52	1,448	1500		1,500				
MEAN	**58,564**	**86**	**1357**	**1444**	**1,289**	**1,149**	**51,451**	**3.01%**	**62**	**0.97**
MAX	**120,591**	**251**	**2601**	**2840**						
MIN	**17,339**	**0**	**451**	**505**						

Information is from: Fast, D. 2001. Draft Yakima Subbasin Summary. August 3, 2001. Prepared for the Northwest Power Planning Council. Laura Berg, editor. Available at: http://ykfp.org/publications/index.htm

COHO
No life history table available.

Table 2. Smolt-to-smolt and smolt-adult survival rates for hatchery coho (Cascade) in the Yakima Basin, 1985-2000.

Year	Smolt Survival To Chandler (%)	Smolt To Adult Survival (%)
1985	45.1	.088
1986	57.0	.100
1987	39.4	.004
1988	73.3	.035
1989	32.1	.043
1990	31.3	.053
1991	23.4	.036
1992	17.6	.034
1993	15.5	.100
1994	52.3	.088
1995	58.9	.142
1996	64.5	.118
1997	70.0 (based on Mc Nary)	.451
1998	33.8	.256
1999	11.7	N/A
2000	19.8	N/A

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SEC. 1201. PURPOSES.

The purposes of this title are--

(1) to protect, mitigate, and enhance fish and wildlife through improved water management; improved instream flows; improved water quality; protection, creation and enhancement of wetlands; and by other appropriate means of habitat improvement;

(2) to improve the reliability of water supply for irrigation;

(3) to authorize a Yakima River basin water conservation program that will improve the efficiency of water delivery and use; enhance basin water supplies; improve water quality; protect, create and enhance wetlands; and determine the amount of basin water needs that can be met by water conservation measures;

(4) to realize sufficient water savings from the Yakima River Basin Water Conservation Program so that not less than 40,00 acre-feet of water savings per year are achieved by the end of the fourth year of the Basin Conservation Program, and not less than 110,000 acre-feet of water savings per year are achieved by the end of the eighth year of the program, to protect and enhance fish and wildlife resources; and not less than 55,000 acre-feet of water savings per year are achieved by the end of the eighth year of the program for availability for irrigation;

(5) to encourage voluntary transactions among public and private entities which result in the implementation of water conservation measures, practices, and facilities; and

(6) to provide for the implementation by the Yakama Indian Nation at its sole discretion of (A) an irrigation demonstration project on the Yakama Indian Reservation using water savings from system improvements to the Wapato Irrigation Project, and (B) a Toppenish Creek corridor enhancement project integrating agricultural, fish, wildlife, and cultural resources.

SEC. 1202. DEFINITIONS.

As used in this title:

(1) The term “Basin Conservation Plan” means a plan for implementing water conservation measures found in the various water conservation plans developed under the Basin Conservation Program.

(2) The Term “Basin Conservation Program”: means the Yakima River Basin Water Conservation Program established under section 1203(a).

(3) The term “comprehensive basin operating plan” means a plan that will provide guidance to the Yakima Project Superintendent for operation of the existing Yakima Project as modified by actions taken pursuant to this title.

(4) The term “Conservation Advisory Group” means the Yakima River Basin Conservation Advisory Group established under section 1203(c).

(5) The term “conserved water” means water saved and attributable to the program established under the Basin Conservation Program.

(6) The term "Irrigation Demonstration Project" means the Yakama Indian Reservation Irrigation Demonstration Project authorized in section 1204(b).

(7) The term "non-proratable water" means that portion of the total water supply available under provisions of sections 18 and 19 of Civil Action No. 21 (Federal District Court Judgment of January 31, 1945) that is not subject to proration in times of water shortage.

(8) The term "on-district storage" means small water storage facilities located within the boundaries of an irrigation entity, including reregulating reservoirs, holding ponds, or other new storage methods which allow for efficient water use.

(9) The term "proratable water" means that portion of the total water supply available under provisions of sections 18 and 19 of Civil Action No. 21 (Federal District Court Judgment of January 31, 1945) that is subject to proration in times of water shortage.

(10) The term "Secretary" means the Secretary of the Interior.

(11) The term "System Operations Advisory Committee" means a group of fishery biologists--

(A) created by the Yakima Project Superintendent in response to the supplemental instructions entitled "Supplementary Instructions to the Water Master," and dated, November 28, 1980, in the case of Kittitas Reclamation District, et al., vs. the Sunnyside Valley Irrigation District, et al. (E.D. Wash., Civil No. 21.);

(B) who advise the Yakima Project Superintendent on operations of the Yakima Project for fish and wildlife purposes; and

(C) who, together with others, were identified for consultation on November 29, 1990, in the amended partial summary judgment entered in the basin adjudication (Yakima County superior Court No. 77-2-01484-5).

(12) The term "Toppenish Enhancement Project" means the Toppenish Creek corridor enhancement project authorized by section 1204(c).

(13) The term "Yakama Indian Nation" means the Confederated Tribes and Bands of the Yakama Indian Nation as redesignated under section 1204(g).

(14) The term "Yakima Project Superintendent" means the individual designated by the Regional Director, Pacific Northwest Region, Bureau of Reclamation, to be responsible for the operations and management of the Yakima Federal Reclamation Project, Washington.

SEC. 1203. YAKIMA RIVER BASIN WATER CONSERVATION PROGRAM.

(a) ESTABLISHMENT- (1) The Secretary, in consultation with the State of Washington, the Yakama Indian Nation, Yakima River basin irrigators, and other interested parties, shall establish and administer a Yakima River Basin Water Conservation Program for the purpose of evaluating and implementing measures to improve the availability of water supplies for irrigation and the protection and enhancement of fish and wildlife resources, including wetlands, while improving the quality of water in the Yakima Basin. The Secretary may make grants to eligible entities for the purposes of carrying out this title under such terms and conditions as the Secretary may require. Such terms and conditions shall include requirements that all water districts, irrigation districts, individuals, or other entities eligible to participate in

the Basin Conservation Program must equip all surface water delivery systems within their boundaries with volumetric water meters or equally effective water measuring methods within 5 years of the date of enactment of this Act.

(2) Conserved water resulting in whole or in part from the expenditure of Federal funds shall not be used to expand irrigation in the Yakima Basin, except as specifically provided in section 1204(a)(3) on the Yakama Indian Reservation.

(3) The provision of this section shall not apply to the Yakama Indian Nation except as to any funds specifically applied for from the Basin Conservation Program.

(b) FOUR PHASES OF PROGRAM- The Basin Conservation Program shall encourage and provide funding assistance for four phases of water conservation, which shall consist of the following:

(1) The development of water conservation plans, consistent with applicable water conservation guidelines of the Secretary, by irrigation districts, conservation districts, water purveyors, other area wide entities, and individuals not included within an area wide entity.

(2) The investigation of the feasibility of specific potential water conservation measures identified in conservation plans.

(3) The implementation of measures that have been identified in conservation plans and have been determined to be feasible.

(4) Post-implementation monitoring and evaluation of implemented measures.

(c) CONSERVATION ADVISORY GROUP- (1) Not later than 12 months after the date of enactment of this Act, the Secretary, in consultation with the State of Washington, the Yakama Indian Nation, Yakima River basin irrigators, and other interested and related parties, shall establish the Yakima River Basin Conservation Advisory Group.

(2) Members of the Conservation Advisory Group shall be appointed by the Secretary and shall be comprised of--

(A) one representative of the Yakima River basin non-proratable irrigators,

(B) one representative of the Yakima River basin proratable irrigators,

(C) one representative of the Yakama Indian Nation,

(D) one representative of environmental interest,

(E) one representative of the Washington State University Agricultural Extension Service,

(F) one representative of the Department of Wildlife of the State of Washington, and

(G) one individual who shall serve as the facilitator.

(3) The Conservation Advisory Group shall--

(A) provide recommendations to the Secretary and to the State of Washington regarding the structure and implementation of the Basin Conservation Program,

(B) provide recommendations to the Secretary and to the State of Washington regarding the establishment of a permanent program for the measurement and reporting of all natural flow and contract diversions within the basin,

(C) structure a process to prepare a basin conservation plan as specified in subsection (f),

(D) provide annual review of the implementation of the applicable water conservation guidelines of the Secretary, and

(E) provide recommendations consistent with statutes of the State of Washington on rules, regulations, and administration of a process to facilitate the voluntary sale or lease of water.

(4) The facilitator shall arrange for meetings of the Conservation Advisory Group, provide logistical support, and serve as moderator for the meetings.

(5) The Conservation Advisory Group shall consult an irrigation district when considering actions specifically affecting that district. For the purposes of this paragraph, an irrigation district includes the Yakama Reservation Irrigation District.

(6) The Conservation Advisory Group shall be nonvoting, seeking consensus whenever possible. If disagreement occurs, any member may submit independent comments to the Secretary. The Conservation Advisory Group shall terminate 5 years after the date of its establishment unless extended by the Secretary.

(d) COST-SHARING- (1) Except as otherwise provided by this title, costs incurred in the four phases of the Basin Conservation Program shall be shared as follows:

	Non-Federal		
Program Phase	State Grant	Local	Federal Grant
1. Development of water conservation plans	50% but not more than $200,000 per recipient	(Residual amount if any)	50%
2. Investigation of specific water conservation measures	50% but sum of 1 and 2 not greater than $200,000 per recipient	20% after deducting State funds for Item 2	Residual amount after deducting State and local funds for Item 2
3. and 4. Implementation and post-implementation monitoring and evaluation	17.5%	17.5%	65.0%

(2) The Yakima River Basin Water Enhancement Project is a Federal action to improve streamflow and fish passage conditions and shall be considered part of a comprehensive program to restore the Yakima River basin anadromous fishery resource. Related fishery resource improvement facilities which utilize funding sources under the Pacific Northwest Electric Power Planning and Conservation Act of 1989, (94 Stat. 2697) and independent water-related improvements of the State of Washington and other public and private entities to improve irrigation water use, water supply, and water quality, shall be treated as non-Federal cost-share expenditures and shall be consolidated in any final calculation of required cost-sharing. Within one year of the date of enactment of this Act, the Secretary shall enter into a binding cost-sharing agreement with the State of Washington. The agreement shall describe the

terms and conditions of specific contributions and other activities that may, subject to approval by the Secretary, qualify as non-Federal cost-share expenditures.

(3) Costs of the Basin Conservation Program related to projects on the Yakama Indian Reservation are a Federal responsibility and shall be non-reimbursable and not subject to the cost-sharing provisions of this subsection.

(e) ENTITY WATER CONSERVATION PLANS- To participate in the Conservation Basin Program an entity must submit a proposed water conservation plan to the Secretary. The Secretary shall approve a water conservation plan submitted under this subsection if the Secretary determines that the plan meets the applicable water conservation guidelines of the Secretary.

(f) BASIN CONSERVATION PLAN- The Conservation Advisory Group shall, within 2½ years after the date of enactment of this Act, submit a draft basin conservation plan to the Secretary.

(g) PUBLIC COMMENT- The Secretary shall distribute the draft basin conservation plan and the entity water conservation plans submitted under subsections (e) and (f), respectively, for public comment for a 60-day period.

(h) PUBLICATIONS OF BASIN CONSERVATION PLAN- Within 60 days after the close of the comment period under subsection (g), the Secretary shall publish the Basin Conservation Plan which plan will provide the basis--

(1) for prioritizing and allocating funds to implement conservation measures under this title; and

(2) for preparing an interim comprehensive basin operating plan under section 1210 of this title as provided for in Public Law 96-162 (93 Stat. 1241).

(i) CONSERVATION MEASURES- (1) Measures considered for implementation in the Basin Conservation Program may include, among others, conveyance and distribution system monitoring, automation of water conveyance systems, water measuring or metering devices and equipment, lining and piping of water conveyance and distribution systems, on-district storage, electrification of hydraulic turbines, tail-water recycling, consolidation of irrigation systems, irrigation scheduling, and improvement of on-farm water application systems. Basin Conservation Program funds may also be used throughout all four phases of the Basin Conservation Program to mitigate for adverse impacts of program measures.

(2) In addition to implementing existing technologies, the Secretary shall encourage the testing of innovative water conservation measures. The Secretary shall, to the maximum extent possible under applicable Federal, State, and tribal law, cooperate with the State of Washington to facilitate water and water right transfers, water banking, dry year operations, the sale and leasing of water, and other innovative allocation tools used to maximize the utility of existing Yakima River basin water supplies.

(3) The Secretary may, consistent with applicable law, use funds appropriated to carry out this section for the purchase or lease of land, water, or water rights from any entity or individual willing to limit or forego water use on a temporary or permanent basis. Funds used for purchase or lease under this paragraph are not subject to the cost-sharing provisions of subsection (d). Efforts to acquire water should be made immediately upon

availability of funds to meet the three-year goal specified in section 1205(a)(4) to provide water to be used by the Yakima Project Superintendent under the advisement of the System Operations Advisory Committee for instream flow purposes. The use of Basin Conservation Program funds under this paragraph are in addition to those specifically authorized to be appropriated by subsection (j)(4).

(4) On-farm water management improvements shall be coordinated with programs administered by the Secretary of Agriculture and State conservation districts.

(j) AUTHORIZATION OF APPROPRIATIONS- There is hereby authorized to be appropriated to the Secretary, at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuations of applicable cost indexes, the following amounts for the Basin Conservation Program:

(1) $1,000,000 for the development of water conservation plans.

(2) $4,000,000 for investigation of specific potential water conservation measures identified in conservation plans for consideration for implementing through the Basin Conservation Program.

(3) Up to $67,500,000 for design, implementation, post-implementation monitoring and evaluation of measures, and addressing environmental impacts.

(4) Up to $10,000,000 for the initial acquisition of water from willing sellers or lessors specifically to provide instream flows for interim periods to facilitate the outward mitigation of anadromous fish flushing flows. Such funds shall not be subject to the cost-sharing provisions of subsection (d).

(5) $100,000 annually for the establishment and support of the Conservation Advisory Group during its duration. Such funds shall be available for travel and per diem, rental of meeting rooms, typing, printing and mailing, and associated administrative needs. The Secretary and the State of Washington shall provide appropriate staff support to the Conservation Advisory Group.

SEC. 1204. YAKAMA INDIAN NATION.

(a) WAPATO IRRIGATION PROJECT IMPROVEMENTS AND APPROPRIATIONS-

(1) The Yakama Indian Nation's proposed system improvements to the Wapato Irrigation Project, as well as the design, construction, operation, and maintenance of the Irrigation Demonstration Project and the Toppenish Creek corridor enhancement project, pursuant to this title shall be coordinated with the Bureau of Indian Affairs.

(2) There is authorized to be appropriated to the Secretary not more than $23,000,000 for the preparation of plans, investigation of measures, and following the Secretary's certification that such measures are consistent with the water conservation objectives of this title, the implementation of system improvements to the Wapato Irrigation Project. Funding for further improvements within the Wapato Irrigation Project may be acquired under the Basin Conservation Program or other sources identified by the Yakama Indian Nation.

(3) Water savings resulting from irrigation system improvements shall be available for the use of the Yakama Indian Nation for irrigation and other purposes on the reservation and

for protection and enhancement of fish and wildlife within the Yakima River basin. The conveyance of such water through irrigation facilities other than the Wapato Irrigation Project shall be on a voluntary basis and shall not further diminish the amount of water that otherwise would have been delivered by an entity to its water users in years of water proration.

(b) IRRIGATION DEMONSTRATION PROJECT APPROPRIATIONS-

1(A) There is hereby authorized to be appropriated to the Secretary--

(i) at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuations of applicable cost indexes, $8,500,000 for the design and construction of the Yakama Indian Reservation Irrigation Project; and

(ii) such sums as may be necessary for the operation and maintenance of the Irrigation Demonstration Project, including funds for administration, training, equipment, materials, and supplies for the period specified by the Secretary, which sums are in addition to operation and maintenance funds for wildlife and cultural purposes appropriated to the Secretary under other authorization.

(B) Funds may not be made available under this subsection until the Yakama Indian Nation obtains the concurrence of the Secretary in the construction, management, and administrative aspects of the Irrigation Demonstration Project.

(C) After the end of the period specified under subparagraph (A)(ii), costs for the operation and maintenance of the Irrigation Demonstration Project, including funds for administration, training, equipment, materials, and supplies referred to in that subparagraph, shall be borne exclusively by the lands directly benefitting from the Irrigation Demonstration Project.

(2) The Irrigation Demonstration Project shall provide for the construction of distribution and on-farm irrigation facilities to use all or a portion of the water savings, as determined by the Yakama Indian Nation, resulting from the Wapato Irrigation Project system improvements for--

(A) demonstration cost-effective state of the art irrigation water management and conservation,

(B) the training of tribal members in irrigation methods, operation, and management, and

(C) upgrading existing hydroelectric facilities and construction of additional hydroelectric facilities on the reservation to meet irrigation pumping power need.

(c) TOPPENISH CREEK CORRIDOR ENHANCEMENT PROJECT APPROPRIATIONS- There is here by authorized to be appropriated to the Secretary $1,500,000 for the further investigation by the Yakama Indian Nation of measures to develop a Toppenish Creek corridor enhancement project to demonstrate integration of management of agricultural, fish, wildlife, and cultural resources to meet tribal objectives and such amount as the Secretary subsequently determines is necessary for implementation. There is also authorized to be appropriated to the Secretary such sums as may be necessary for the operation and maintenance of the Toppenish Enhancement Project.

(d) REPORT- Within 5 years of the implementation of the Irrigation Demonstration Project and the Toppenish Enhancement Project, the Secretary, in consultation with the Yakama Indian Nation, shall report to the Committee on Energy and Natural Resources of the Senate, the Committee on Natural Resources of the House of Representatives, and the Governor of the State of Washington on the effectiveness of the conservation, training, mitigation, and other measures implemented.

(e) STATUS OF IMPROVEMENTS AND FACILITIES- The Wapato Irrigation Project system improvements and any specific irrigation facility of the Irrigation Demonstration Project (excluding on-farm irrigation facilities) and the Toppenish Enhancement Project shall become features of the Wapato Irrigation Project.

(f) TREATMENT OF CERTAIN COSTS- Costs related to Wapato Irrigation Project improvements, the Irrigation Demonstration Project, and the Toppenish Enhancement Project shall be a Federal responsibility and are nonreimbursable and nonreturnable.

(g) REDESIGNATION OF YAKIMA INDIAN NATION TO YAKAMA INDIAN NATION-

(1) REDESIGNATION- The Confederated Tribes and Bands of the Yakima Indian Nation shall be know and designated as the “Confederated Tribes and Bands of the Yakama Indian Nation.”

(2) REFERENCES- Any reference in a law, map, regulation, document, paper, or other record fo the United States to the Confederated Tribes and Bands of the Yakima Indian Nation referred to in subsection (a) shall be deemed to be a reference to the “Confederated Tribes and Bands of the Yakama Indian Nation.”

SEC. 1205. OPERATION OF YAKIMA BASIN PROJECTS.

(a) WATER SAVINGS FROM BASIN CONSERVATION PROGRAM-

(1) The Basin Conservation Program is intended to result in reductions in water diversions allowing for changes in the present operation of the Yakima Project to improve stream flow conditions in the Yakima River basin. Except as provided by paragraph (5) of this subsection and section 1209, commencing with the enactment of this title, and nothwithstanding that anticipated water savings are yet to be realized, the Secretary, upon the enactment of this title and acting through the Yakima Project Superintendent, shall (A) continue to estimate the water supply which is anticipated to be available to meet water entitlements; and (B) provide instream flows in accordance with the following criteria:

Water Supply Estimate for Period (million acre-feet):				Target Flow from date of Estimate thru October Downstream of (cubic feet per second):	
April thru September	May thru September	June thru September	July thru September	Sunnyside Diversion Dam	Prosser Diversion Dam
(1) 3.2	2.9	2.4	1.9	600	600
(2) 2.9	2.65	2.2	1.7	500	500
(3) 2.65	2.4	2.0	1.5	400	400
Less than line 3 water supply				300	300

(2) The initial target flows represent target flows at the respective points. Reasonable fluctuations from these target flows are anticipated in the operation of the Yakima Project, except that for any period exceeding 24 hours--

(A) actual flows at the Sunnyside Diversion Dam may not decrease to less than 65 percent of the target flow at the Sunnyside Diversion Dam; and

(B) actual flows at the Prosser Diversion Dam may not decrease by more than 50 cubic feet per second from the target flow.

(3) The instream flows shall be increased for interim periods during any month of April through October to facilitate when necessary the outward migration of anadromous fish. Increased instream flows for such interim periods shall be obtained through voluntary sale and leasing of water or water rights or from conservation measures taken under this title.

(4)(A)(i) Within the three-year period beginning when appropriations are first provided to carry out the Basin Conservation Program, the instream flow goal in the Yakima River is as follows: to secure water which is to be used for instream flows to facilitate meeting recommendations of the System Operations Advisory Committee for flushing flows or other instream uses.

(ii) In addition to any other authority of the Secretary to provide water for flushing flows, the water required to meet the goal specified in clause (i) shall be acquired through the voluntary purchase or lease of land, water, or water rights and from the development of additional storage capability at Lake Cle Elum provided for in section 1206(1).

(iii) In addition to water required to meet the instream flow goal specified in clause (i), the System Operations Advisory Committee may recommend additional water to meet instream flow goals pursuant to judicial actions.

(B) After the period referred to in subparagraph (A), such instream flow goal is modified as follows:

(i) The goal increases so that the instream target flows specified in the table in paragraph (1) increase by 50 cubic feet per second for each 27,000 acre-feet of

reduced annual water diversions achieved through implementation of measures under the Basin Conservation Program. Such increases do not apply to actions taken pursuant to section 1204. Such increases shall not further diminish the amount of water that otherwise would have been delivered by an entity to its water users in years of water proration.

(ii) The goal changes directly with the availability of water resulting from Federal expenditures under this title for purchase or lease of water under this title.

(C) The Yakima Project Superintendent shall maintain an account of funded and completed conservation measures taken under the Basin Conservation Program.

(D) No later than March 31 of each calendar year, the Yakima Project Superintendent shall meet with the State of Washington, Yakama Indian Nation, and Yakima River basin irrigators to mutually determine total diversion reductions and respective adjustments to the target flows referred to in this subsection. The Yakima Project Superintendent shall announce such adjustments with the announcements of Total Water Supply Available. For the purposes of this subparagraph, conserved water will be considered available for adjusting target flows in the first year following completion of a measure or following a result from the post-implementation monitoring and evaluation program, as the case may be.

(5) Operational procedures and processes in the Yakima River basin which have or may be implemented through judicial actions shall not be impacted by this title.

(6)(A) Within three years after the date of enactment of this Act, the Secretary shall conduct a study and submit a report with recommendations to the appropriate committees of the Congress on whether the water supply available for irrigation is adequate to sustain the agricultural economy of the Yakima River Basin.

(B) The target flows provided for under this subsection shall be evaluated within three years after the date of enactment of this Act by the Systems Operations Advisory Committee for the purpose of making a report with recommendations to the Secretary and the Congress evaluating what is necessary to have biologically-based target flows.

(C) The recommendations and reports under subparagraphs (A) and (B) shall provide a basis for the third phase of the Yakima River Basin Water Enhancement Project.

(b) WATER FROM LAKE CLE ELUM- Water accruing from the development of additional storage capacity at Lake Cle Elum, made available pursuant to the modifications authorized in section 1206(a), shall not be part of the Yakima River basin's water supply as provided in subsection (a)(1). Water obtained from such development is exclusively dedicated to instream flows for use by the Yakima Project Superintendent as flushing flows or as otherwise advised by the System Operations Advisory Committee. Water may be carried over from year-to-year in the additional capacity to the extent that there is space available. Releases may be made from other Yakima Project storage facilities to most effectively utilize this additional water, except that water deliveries to holders of existing water rights shall not be impaired.

(c) STATUS OF BASIN CONSERVATION PROGRAM FACILITIES-

Measures of the Basin Conservation Program which are implemented on facilities currently under the administrative jurisdiction of the Secretary, except as provided in section 1204, shall

be considered features of the Yakima Project. The responsibility for operation and maintenance and the related costs shall remain with the current operating entity. As appropriate, the Secretary shall incorporate the operation and maintenance of such facilities into existing agreements. The Secretary shall assure that such facilities are operated in a manner consistent with Federal and State law and in accordance with water rights recognized pursuant to State and Federal law.

(d) WATER ACQUIRED BY PURCHASE AND LEASE- Water acquired from voluntary sellers and lessors shall be administered as a block of water separate from the Total Water Supply Available, in accordance with applicable Federal and State law.

(e) YAKIMA PROJECT PURPOSE- (1) An additional purpose of the Yakima Project shall be for fish, wildlife, and recreation.

(2) The existing storage rights of the Yakima Project shall include storage for the purposes of fish, wildlife, and recreation.

(3) The purposes specified in paragraph (1) and (2) shall not impair the operation of the Yakima Project to provide water for irrigation purposes nor impact existing contracts.

SEC. 1206. LAKE CLE ELUM AUTHORIZATION OF APPROPRIATIONS.

(a) MODIFICATIONS AND IMPROVEMENTS- There is hereby authorized to be appropriated to the Secretary--

(1) at September 1990 prices, plus or minus such amounts as may be justified by reason of ordinary fluctuation of applicable indexes, $2,934,000 to--

(A) modify the radial gates at Cle Elum Dam to provide an additional 14,600 acre-feet of storage capacity in Lake Cle Elum,

(B) provide for shoreline protection of Lake Cle Elum, and

(C) construct juvenile fish passage facilities at Cle Elum Dam, plus

(2) such additional amounts as may be necessary which may be required for environmental mitigation.

(b) OPERATION AND MAINTENANCE APPROPRIATIONS- There is hereby authorized to be appropriated to the Secretary such sums as may be necessary for that portion of the operation and maintenance of Cle Elum Dam determined by the Secretary to be a Federal responsibility.

SEC. 1207. ENHANCEMENT OF WATER SUPPLIES FOR YAKIMA BASIN TRIBUTARIES.

(a) GENERAL PROVISIONS- The following shall be applicable to the investigation and implementation of measures to enhance water supplies for fish and wildlife and irrigation purposes on tributaries of the Yakima River basin:

(1) An enhancement program authorized by this section undertaken in any tributary shall be contingent upon the agreement of appropriate water right owners to participate.

(2) The enhancement program authorized by this section shall not be construed to affect

(A) the water rights of any water right owners in the tributary or other water delivering

entities; (B) the capability of tributary water users to divert, convey, and apply water: and (C) existing water and land uses within the tributary area.

(3) The water supply for tributary enhancement shall be administered in accordance with applicable State and Federal laws.

(4) Any enhancement program authorized by this section shall be predicated upon the availability of a dependable water supply.

(b) STUDY- (1) The Secretary, following consultation with the State of Washington, the tributary water right owners, and the Yakama Indian Nation, and agreement of appropriate water right owners to participate, shall conduct a study concerning the measures that can be implemented to enhance water supplies for fish and wildlife and irrigation purposes on Taneum Creek, including (but not limited to)--

(A) water use efficiency improvements;

(B) the conveyance of water from the Yakima Project through the facilities of any irrigation entity willing to contract with the Secretary without adverse impact to water users;

(C) the construction, operation, and maintenance of ground water withdrawal facilities;

(D) contracting with any entity that is willing to voluntarily limit or forego present water use through lease or sale of water or water rights on a temporary or permanent basis;

(E) purchase of water rights from willing sellers; and

(F) other measures compatible with the purposes of this title, including restoration of stream habitats.

(2) In conducting the Taneum Creek study, the Secretary shall consider–

(A) the hydrologic and environmental characteristics;

(B) the engineering and economic factors relating to each measure; and

(C) the potential impacts upon the operations of present water users in the tributary and measures to alleviate such impacts.

(3)The Secretary shall make available to the public for a 45-day comment period a draft report describing in detail the findings, conclusions, and recommendations of the study. The Secretary shall consider and include any comment made in developing a final report. The Secretary's final report shall be submitted to the Committee on Energy and Natural Resources of the Senate, the Committee on Natural Resources of the House of Representatives, and the Governor of the State of Washington, and made available to the public.

(c) IMPLEMENTATION OF NONSTORAGE MEASURES- After securing the necessary permits the Secretary may, in cooperation with the Department of Ecology of the State of Washington and in accordance with the laws of the State of Washington, implement nonstorage measures identified in the final report under subsection (b) upon fulfillment of the following conditions:

(1) The Secretary shall enter into an agreement with the appropriate water right owners who are willing to participate, the State of Washington, and the Yakama Indian Nation, for the use and management of the water supply to be provided by proposed tributary measures pursuant to this section.

(2) The Secretary and the State of Washington find that the implementation of the proposed tributary measures will not impair the water rights of any person or entity in the affected tributary.

(d) OTHER YAKIMA RIVER BASIN TRIBUTARIES- Enhancement programs similar to the enhancement program authorized by this section may be investigated an implemented by the Secretary in other tributaries contingent upon the agreement of the appropriate tributary water right owners to participate. The provisions set forth in this section shall be applicable to such programs.

(e) AUTHORIZATION OF APPROPRIATIONS- (1) There is hereby authorized to be appropriated to the Secretary $400,000 for the study of the Taneum Creek Project and such amount as the Secretary subsequently determines is necessary for implementation of tributary measures pursuant to this section.

(1) There is also authorized to be appropriated to the Secretary such funds as are necessary for the investigation of enhancement programs similar to the enhancement program authorized by this section in other Yakima River basin tributaries contingent upon the agreement of the appropriate water right owners to participate. Funds for the implementation of any such similar enhancement program may not be appropriated until after the Secretary submits an investigation report to the appropriate congressional committees.

SEC. 1208. CHANDLER PUMPING PLANT AND POWERPLANT-OPERATIONS AT PROSSER DIVERSION DAM.

(a) AUTHORIZATION OF APPROPRIATIONS FOR ELECTRIFICATION- In order to provide for electrification to enhance instream flows by eliminating the need to divert water to operate the hydraulic turbines which pump water to the Kennewick Irrigation District, there is authorized to be appropriated--

(1) $50,000 to conduct an assessment of opportunities for alternative pumping plant locations;

(2) $4,000,000 for construction; and

(3) such sums as may be necessary for the pro rata share of the operation and maintenance allocated to fish and wildlife as determined by the Secretary.

(b) POWER FOR PROJECT PUMPING- (1) The Administrator of the Bonneville Power Administration shall provide for project power needed to effect the electrification as provided in subsection (a).

(2)(A) There is authorized to be appropriated for the Bureau of Reclamation for each fiscal year in which the Administrator provides power under this subsection, an amount equal to the cost to the Bonneville Power Administration of providing power under this subsection during such fiscal year. The rate to be utilized by the Administrator in determining the cost of power under this paragraph in a fiscal year shall be the rate for priority firm power charged by the Bonneville Power Administration in that fiscal year under section 7(b) of the Pacific Northwest Electric Power Planning and Conservation Act (16 U.S.C. 834e(b)).

(B) The Bureau of Reclamation shall, using funds appropriated pursuant to the Authorization of appropriations in subparagraph (A), reimburse the Bonneville Power Administration for the costs of the project power provided under this subsection. Such funds shall be available for sue purpose without fiscal year limitation.

(c) SUBORDINATION- Any diversions for hydropower generation at the Chandler Powerplant shall be subordinated to meet the flow targets determined under subsection (f).

(d) WATER SUPPLY FOR KENNEWICK IRRIGATION DISTRICT- The Secretary shall ensure that the irrigation water supply for the Kennewick Irrigation District shall not be affected by conservation, electrification, or subordination pursuant to this title and any reduction in its irrigation water supply resulting from conservation measures adopted or implemented by other entities pursuant to this title shall be replaced by water developed through subordination, electrification, or a combination of the two.

(e) TREATMENT OF CERTAIN FUNDS- Funds appropriated and project power provided pursuant to this section shall be nonreimbursable since such funds are used for fish and wildlife purposes and such funds are not subject to cost-share under section 1203(d).

(f) TARGET FLOWS- Target flows measured at appropriate biological and hydrological location or locations shall be determined by the Yakima Project Superintendent in consultation with the System Operations Advisory Committee.

SEC. 1209. AUGMENTATION OF KACHESS RESERVOIR STORED WATER.

(a) AUTHORIZATION OF APPROPRIATIONS- In order to augment Kachess Reservoir stored water supplied from flows of Cabin Creek and Silver Creek which are excess to system demands, there is authorized to be appropriated–

(1) such sums as may be necessary to carry out a feasibility study, including the benefits, costs, and environmental aspects, of the facility described in paragraph (2);

(2) for the construction of facilities to convey such flows to Kachess Reservoir, $20,000,000; and

(3) such sums as may be necessary for the pro rata share of the operation and maintenance allocated to fish and wildlife determined by the Secretary.

(b) LIMITATION- Construction of the facilities described in subsection (a)(1) is contingent on the completion of the feasibility study referred to in subsection (a)(2).

(c) USE OF ADDITIONAL WATER- The stored water supply resulting from the construction of facilities under this section shall be used by the Secretary to–

(1) enhance the water supply available to the Kittitas Reclamation District and the Roza Irrigation District in years of proration; and

(2) facilitate reservoir operations in the Easton Dam to Keechelus Dam reach of the Yakima River for the propagation of anadromous fish.

(d) TREATMENT OF COSTS- The construction and operation and maintenance costs of the facilities under this section shall be allocated to irrigation and fishery enhancement, as follows:

(1) The portion of such costs allocated to irrigation is reimbursable, with the construction costs to be paid prior to initiation of construction by the Kittitas Reclamation District and the Roza Irrigation District.

(2) The portion of such costs allocated to fishery enhancement is nonreimbursable.

(e) KACHESS DAM MODIFICATIONS- There is authorized to be appropriated $2,000,000 for the modification of the discharge facilities of Kachess Dam to improve reservoir operations for anadromous fish enhancement. Amounts appropriated under this subsection are nonreimbursable.

SEC. 1210. INTERIM COMPREHENSIVE BASIN OPERATING PLAN.

(a) DEVELOPMENT- The Secretary shall, in consultation with the State of Washington, Yakama Indian Nation, Yakima River basin irrigation districts, Bonneville Power Administration, and other entities as determined by the Secretary, develop an interim comprehensive operating plan for providing a general framework within which the Yakima Project Superintendent operates the Yakima Project, including measures implemented under the Yakima River Basin Water Enhancement Project, Including (but not limited to)--

(1) operating capability and constraints of the system;

(2) information on water supply calculations and water needs;

(3) system operations and stream flow objectives; and

(4) the System Operations Advisory Committee activities.

(b) PROCESS REQUIREMENTS- A draft of the interim comprehensive basin operating plan shall be completed within 18 months after the completion of the Basin Conservation Plan under section 1203(f) and, upon completion, published for a 90-day public review period. The Secretary shall complete and publish the final interim comprehensive operating plan within 90 days after the close of the public review period. The Secretary shall update the plan as needed to respond to decisions from water adjudications relating to the Yakima River basin.

(c) AUTHORIZATION OF APPROPRIATIONS- There is authorized to be appropriated $100,000 to carry out this section.

SEC. 1211. ENVIRONMENTAL COMPLIANCE.

There are hereby authorized to be appropriated to the Secretary $2,000,000 for environmental compliance activities including the conduct, in cooperation with the State of Washington, of an inventory of wildlife and wetland resources in the Yakima River basin and an investigation of measures, including “wetland banking,” which could be implemented to address potential impacts which could result from the activities taken under this title.

SEC. 1212. SAVINGS AND CONTINGENCIES.

(a) IN GENERAL- Nothing in this title shall be construed to–

(1) affect or modify any treaty or other right of the Yakama Indian Nation;

(2) authorize the appropriation or use of water by any Federal, State, or local agency, the Yakama Indian Nation, or any other entity or individual;

(3) impair the rights or jurisdictions of the United States, the States, the Yakama Indian Nation, or other entities over waters of any river or stream or over any ground water resource:

(4) alter, amend, repeal, interpret, modify, or be in conflict with any interstate compact made by the States;

(5) alter, establish, or impair the respective rights of States, the United States, the Yakama Indian Nation, or any other entity or individual with respect to any water or water-related right;

(6) alter, diminish, or abridge the rights and obligations of any Federal, State, or local agency, the Yakama Indian Nation, or other entity, public or private;

(7) affect or modify the rights of the Yakama Indian Nation or its successors in interest to, and management and regulation of, those water resources arising or used, within the external boundaries of the Yakama Indian Reservation;

(8) affect or modify the settlement agreement between the United States and the State of Washington filed in Yakima County Superior Court with regard to Federal reserved water rights other than those rights reserved by the United States for the benefit of the Yakama Indian Nation and its members;

(9) affect or modify the rights of any Federal, State, or local agency, the Yakama Indian Nation, or any other entity, public or private with respect to any unresolved and unsettled claims in any water right adjudications, or court decisions, including State against Acquavella, or constitute evidence in any such proceeding in which any water or water-related right is adjudicated; or

(10) preclude other planning studies and projects to accomplish the purposes of this title by other means, funded publicly, privately, or by a combination of public and private funding.

(b) CONTINGENCY BASED ON APPROPRIATIONS- The performance of any activity under this title which requires accomplishment within a specified period that may require appropriation of money by Congress of the allotment of funds shall be continent upon such appropriation or allotment being made.

ENTITLEMENT SUMMARY *(SUBJECT TO REVISION) SEE ORIGINAL CONTRACTS FOR DETAILED INFORMATION - MARCH-OCTOBER
AS ESTABLISHED JULY 8, 1992

	TOTAL APRIL-OCTOBER		TWSA IRRIGATION ENTITLEMENT																		OWSA ENTITLEMENTS	
	NON-			WARREN	CLAIM		NON	ADJUDICATED	MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER	
DISTRICT USER (ABOVE PARKER)	PRORATABLE AF	PRORATABLE AF	TOTAL AF	ACT/STORAGE CONTRACT	FLOOD WATERS	LIMITING AGREEMENTS	SIGNATORY AGREEMENTS	WATER RIGHTS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS
KITTITAS		336000	336000	Yes	Yes				**ND		6720	308.0	57120	930.0	70560	1186.0	70560	1147.0	67200	1093.0	43680	734.0	20160	726.0
CITY OF CLE ELUM M&I	1260		1260								180	3.0	180	3.0	180	3.0	180	3.0	180	3.0	180	3.0	180	3.0
YOUNGER	3010		3010								40	1.0	440	7.0	780	13.0	790	13.0	740	12.0	180	3.0	40	0.6
O'CONNOR	3100		3100				Yes						330	5.0	660	11.0	830	13.5	740	12.0	450	7.5	90	1.5
[1]CASCADE	49525		49525	Yes		Yes					8925	150.0	9223	150.0	8925	150.0	8452	150.0	5600	150.0	5600	150.0	2800	150.0
WESTSIDE	31128	8200	39328	Yes		Yes					4760 550	80.0 25.0	4919 1550	80.0 25.0	4760 1500	80.0 25.0	4919 1550	80.0 25.0	4919 1550	80.0 25.0	4760 1500	80.0 25.0	2091 0	34.0 0.0
KNOKE (ELLISON-BURTON)	1600		1600								110	1.8	300	4.9	350	5.9	370	6.0	330	5.4	120	2.0	20	0.3
MILLS & SON	7530		7530								1190	20.0	1230	20.0	1190	20.0	1230	20.0	1230	20.0	1190	20.0	270	4.4
ELLENSBURG TOWN	47758		47758			Yes					7438	125.0	7686	125.0	7438	125.0	7686	125.0	7686	125.0	5950	100.0	3874	63.0
WOLDALE (OLSON)	12973		12973			Yes					2023	34.0	2091	34.0	2023	34.0	2091	34.0	2091	34.0	1547	26.0	1107	18.0
CITY/ELLENSBURG M&I		6000	6000	Yes							120	2.0	1020	16.6	1260	21.0	1260	20.0	1200	19.5	780	13.0	360	10.0
ELLENSBURG POWER	6031		6031								928	15.6	959	15.6	928	15.6	959	15.6	959	15.6	928	15.6	370	6.0
ELLENSBURG MILL & FEED	4804		4804				Yes				702	11.8	726	11.8	702	11.8	726	11.8	726	11.8	702	11.8	520	8.5
BULL	6471		6471				Yes				1012	17.0	1045	17.0	1012	17.0	1045	17.0	1045	17.0	1012	17.0	300	4.9
FOGARTY & DYER	3690		3690	Yes							108	1.8	638	10.4	717	12.0	794	12.9	733	11.9	480	8.1	220	3.6
VERTREES #1	2164		2164				Yes				181	3.0	407	6.6	400	6.7	551	9.0	428	7.0	177	3.0	20	0.3
VERTREES #2	704		704				Yes				107	1.8	111	1.8	107	1.8	111	1.8	111	1.8	107	1.8	50	0.8
T JOSSEM	4771		4771								756	12.7	781	12.7	756	12.7	781	12.7	781	12.7	756	12.7	160	2.6
FARREL (STANFIELD)	1600		1600								30	0.5	280	4.6	370	6.0	430	7.0	330	5.4	100	1.7	60	1.0
ROZA ID		375000	375000	Yes	Yes				18000		37500	630.0	56250	915.0	71250	1198.0	71250	1159.0	71250	1159.0	45000	756.0	22500	567.0
TERRACE HEIGHTS ID AT ROZA DAM	2208	1354	3562								357 136	6.0 2.3	369 216	6.0 3.5	357 257	6.0 4.3	369 284	6.0 4.6	369 271	6.0 4.5	250 190	4.2 3.2	137 0	2.2 0.0
SELAH/MOXEE ID	27493	4281	31774	Yes		Yes					4284 427	72.0 7.2	4427 685	72.0 11.1	4284 814	72.0 13.1	4427 898	72.0 14.6	4427 857	72.0 14.4	3320 600	55.8 9.8	2324 0	37.8 0.0
TAYLOR	8000		8000			Yes					1190	20.0	1230	20.0	1190	20.0	1230	20.0	1230	20.0	1190	20.0	740	11.5
MOXEE DITCH CO	4245	960	5205	Yes		Yes					595 86	10.0 1.4	615 144	10.0 2.3	595 182	10.0 3.1	615 182	10.0 3.0	615 182	10.0 3.0	595 125	10.0 2.1	615 59	10.0 1.0
HUBBARD-GRANGER	11165		11165			Yes					1785	30.0	1845	30.0	1785	30.0	1845	30.0	1845	30.0	1250	21.0	810	13.0
BOISE CASCADE	9159	100	9259	Yes							1354 15	23.0 0.3	1399 15	23.0 0.3	1354 15	23.0 0.3	1399 15	23.0 0.3	1399 15	23.0 0.3	1354 15	23.0 0.3	900 10	14.8 0.3
UNION GAP ID OLD "FOWLER DITCH"	20697	4588	25339	Yes		Yes					3273 571	55.0 9.7	3382 734	55.0 11.9	3273 785	55.0 12.9	3382 812	55.0 12.9	3382 872	55.0 13.9	2279 582	38.3 9.9	1726 250	29.0 4.0
RICHARTZ	6364		6364				Yes				892	15.0	922	15.0	892	15.0	922	15.0	922	15.0	892	15.0	922	15.0
BLUE SLOUGH	4245		4245								595	10.0	615	10.0	595	10.0	615	10.0	615	10.0	595	10.0	615	10.0
BROADWAY ID		700	700	Yes							70	1.2	105	1.7	133	2.2	133	2.2	133	2.2	84	1.4	42	0.7
WAPATO I.P.	305613	350000	655613	Yes	Yes	Yes			**ND		42843 31500	720.0 529.0	44271 73500	720.0 1195.0	42843 70000	720.0 1176.0	44271 80500	720.0 1309.0	44271 73500	720.0 1195.0	42843 21000	720.0 353.0	44271 0	720.0 0.0
SUNNYSIDE DIVISION	315836	142684	458520	Yes	Yes	Yes			**ND		47070 7840	791.0 132.0	48636 27874	791.0 453.0	47066 31234	791.0 525.0	48637 31443	791.0 511.0	48637 31443	791.0 511.0	47070 12850	791.0 216.0	28720 0	724.0 0.0
YAKIMA-TIETON ID	75868	38181	114049	Yes	Yes				**ND		6000	0.0 101.0	15372 6641	250.0 108.0	14876 7141	250.0 120.0	15372 6641	250.0 108.0	15372 6641	250.0 108.0	14876 5117	250.0 86.0	0 0	0.0 0.0
COBB - UPPER SIDE	727		727			Yes					119	2.0	123	2.0	119	2.0	123	2.0	123	2.0	60	1.0	60	1.0
SINCLAIR & COBB	786		786			Yes					119	2.0	123	2.0	119	2.0	123	2.0	123	2.0	119	2.0	60	1.0
TENANT	1570		1570								110	1.8	210	3.4	220	3.7	410	6.7	320	5.2	230	3.9	70	1.1
ANDERSON	1570		1570								140	2.4	330	5.4	270	4.5	260	4.2	310	5.0	130	2.2	130	2.1
EMERICK	687		687								119	2.0	123	2.0	119	2.0	123	2.0	123	2.0	60	1.0	20	0.3
NILE	4350		4350				Yes				230	3.9	470	7.6	730	12.2	980	15.9	970	15.8	670	11.2	300	4.9
CARMACK & PARKER	639		639			Yes					95	1.6	98	1.6	95	1.6	98	1.6	98	1.6	95	1.6	60	1.0
FREDERICKS & HUNTING	950		950								120	2.0	130	2.1	170	2.9	170	2.8	180	2.9	140	2.4	40	0.7
STEVENS	1950		1950								60	1.0	410	6.7	350	5.9	410	6.7	320	5.2	290	4.9	110	1.8
NACHES SELAH	49658	4486	54144	Yes		Yes					7080 674	119.0 11.3	7263 811	118.0 13.2	7080 901	119.0 15.1	7321 1050	119.0 17.0	7321 1050	119.0 17.0	6884 0	116.0 0.0	6709 0	109.0 0.0
WAPATOX (IRR.-U&L)	20230		20230			Yes					3064	51.5	3167	51.5	3064	51.5	3167	51.5	3167	51.5	3064	51.5	1537	25.0
"OLD JOHNCOX" FOSTER NACHES	1510		1510			Yes					100	1.7	280	4.5	300	5.0	320	5.2	270	4.4	200	3.4	40	0.7
CLARK	4562		4562			Yes					714	12.0	739	12.0	714	12.0	739	12.0	739	12.0	536	9.0	381	6.2

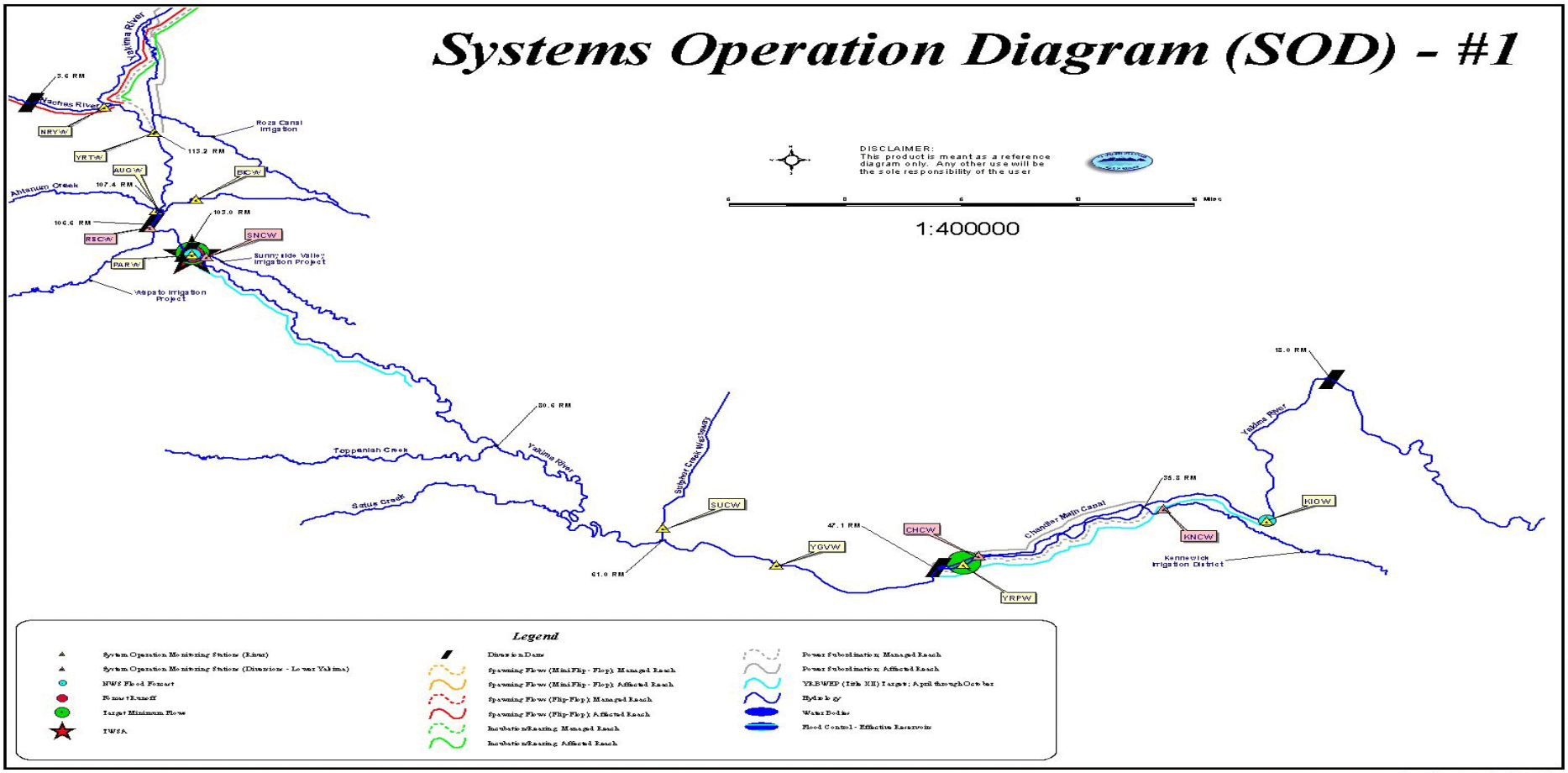
APPENDIX D

ENTITLEMENT SUMMARY *(SUBJECT TO REVISION) SEE ORIGINAL CONTRACTS FOR DETAILED INFORMATION - MARCH-OCTOBER
AS ESTABLISHED JULY 8, 1992

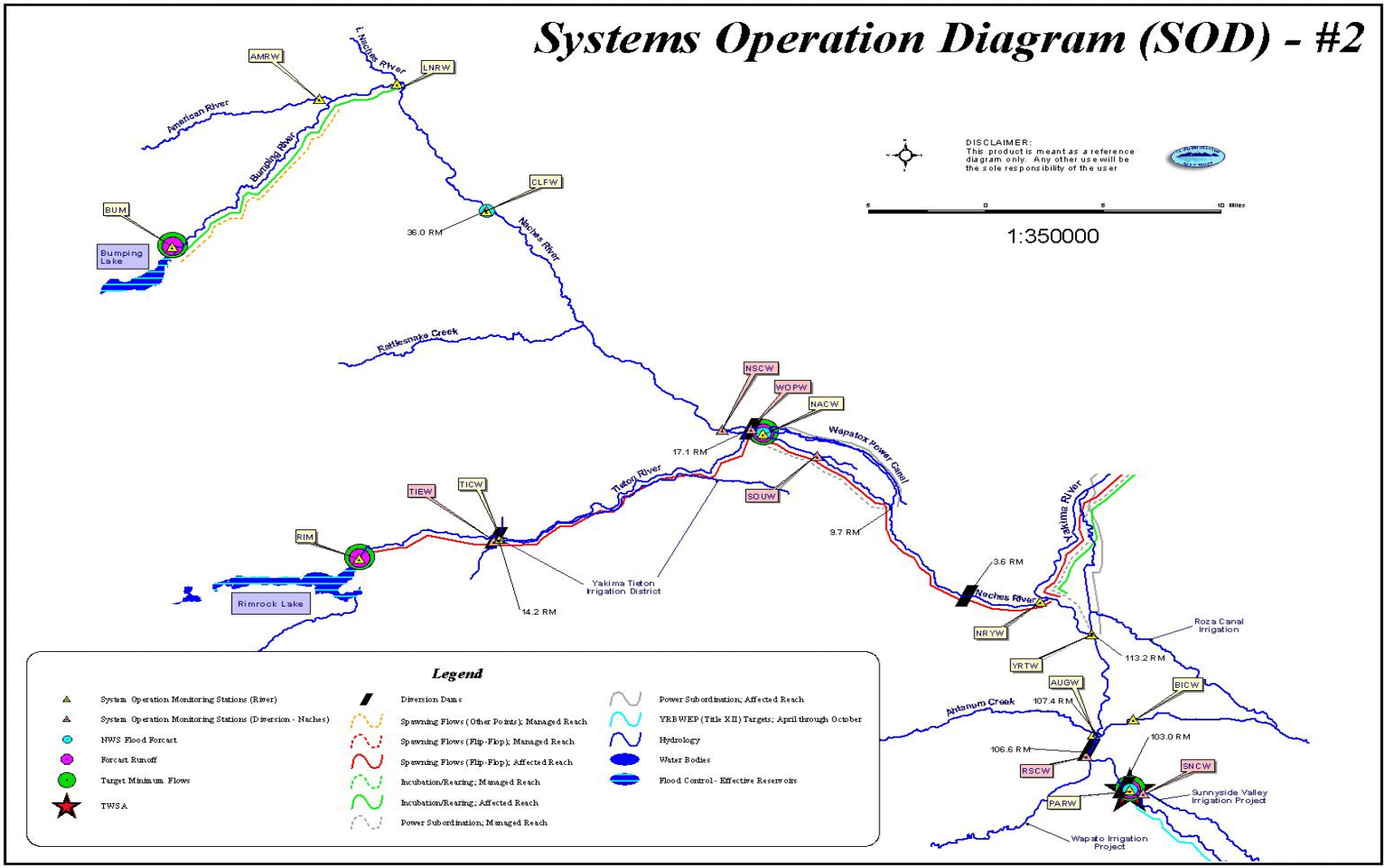
	TOTAL APRIL-OCTOBER		TWSA IRRIGATION ENTITLEMENT																		OWSA ENTITLEMENTS	
	NON-			WARREN	CLAIM		NON	ADJUDICATED	MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER	
DISTRICT USER (ABOVE PARKER)	PRORATABLE AF	PRORATABLE AF	TOTAL AF	ACT/STORAGE CONTRACT	FLOOD WATERS	LIMITING AGREEMENTS	SIGNATORY AGREEMENTS	WATER RIGHTS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS	AF	CFS
SOUTH NACHES CHANNEL	22946		22946			Yes					3689	62.0	3812	62.0	3689	62.0	3812	62.0	3812	62.0	3272	55.0	860	20.0
KELLY & LOWRY	8490		8490				Yes				1190	20.0	1230	20.0	1190	20.0	1230	20.0	1230	20.0	1190	20.0	1230	20.0
YAKIMA CITY (M&I)	4859	4500	9359	Yes		Yes					681 675	11.4 11.3	704 788	11.4 12.8	681 1028	11.4 17.3	704 652	11.4 10.6	704 652	11.4 10.6	681 495	11.4 8.3	704 210	11.4 3.5
YAKIMA CITY (IRR)	8805	1500	10305	Yes		Yes					1232 225	20.7 3.8	1273 262	20.7 4.3	1232 342	20.7 5.7	1273 218	20.7 3.5	1273 218	20.7 3.5	1232 165	20.7 2.8	1290 70	21.0 1.1
NACHES UNION ID (FORMERLY GLEED DITCH)	22819		22819			Yes					3618	60.8	3738	60.8	3618	60.8	3738	60.8	3738	60.8	2475	41.6	1894	30.8
MORRISSEY	1206		1206			Yes					178	3.0	184	3.0	178	3.0	184	3.0	184	3.0	178	3.0	120	2.0
YAKIMA VALLEY CANAL - CONGDON	23720	4305	28025	Yes		Yes					3808 690	64 11.6	3935 713	64 11.6	3808 690	64 11.6	3935 713	64 11.6	3935 713	64 11.6	2469 446	41.5 7.5	1830 340	30.8 5.7
CHAPMAN & NELSON	7641		7641			Yes					1071	18.0	1107	18.0	1071	18.0	1107	18.0	1107	18.0	1071	18.0	1107	18.0
NACHES COWICHE	15096		15096			Yes					2380	40.0	2460	40.0	2380	40.0	2460	40.0	2460	40.0	1726	29.0	1230	20.0
FRUITVALE POWER	17708		17708			Yes					2791	46.9	2884	46.9	2791	46.9	2884	46.9	2884	46.9	2011	33.8	1463	23.8
OLD UNION	17675		17675			Yes					2813	47.3	2907	47.3	2813	47.3	2907	47.3	2907	47.3	1875	31.5	1453	23.6
[2] OTHERS		336	336	Yes							50	0.8	50	0.8	50	0.8	51	0.8	51	0.8	50	0.8	34	0.6
IRRIGATION ENTITLEMENTS	1219166	1283175	2502395								262098		420607		445351		461719		447809		304090		160685	
KENNEWICK ID	18000			Yes					**ND		1800	50.0	3330	50.0	3330	50.0	3330	50.0	3330	50.0	2160	50.0	720	?
		91275	109275								9128	134.0	16886	279.0	16886	290.0	16886	279.0	16886	279.0	10953	170.0	3650	?

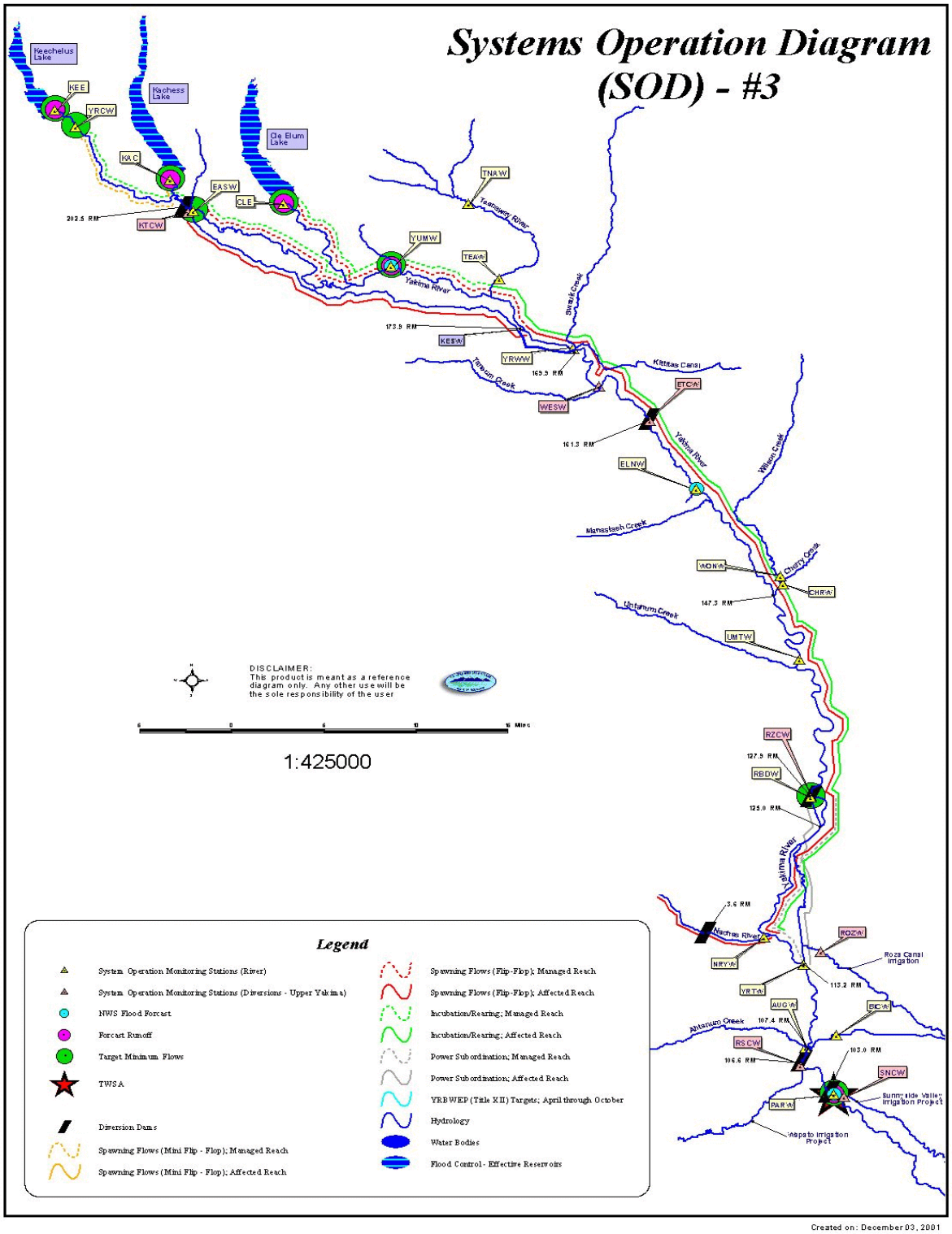
[1] JULY 20 TO OCT. 15 USE 16800 AF -- NOT TO EXCEED FLOW OF 150 CFS
[2] DEPT. OF AGRICULTURE (20) MUOTH (22.9) FUNKHOUSE (13.1) COVEY CANCELLED (120) WAYNE (160)
9/19/94 - THIS AGREES WITH CONTENT MINUS WATER THAT HAD BEEN TRANSFERRED TO CITY OF YAKIMA FOR USE BY CITY AT CHANGED POINT OF DIVERSIC

*Final determination of the total volume of entitlement water awaits the completion of the "Final Order" of this Adjudication Court
**ND - NOT DEFINED



Created on: December 03, 2001


Systems Operation Diagram (SOD) - #2
AMRW
L Naches River
LNRW
American River
Bumping River
BUM
Bumping Lake
CLFW
36.0 RM
Naches River
Rattlesnake Creek
NSCW
WOPW
NACW
Wapatox Power Canal
17.1 RM
TIEW
TICW
Tieton River
SOUW
9.7 RM
RIM
Rimrock Lake
Yakima Tieton Irrigation District
14.2 RM
Yakima River
3.6 RM
Naches River
NRYW
Roza Canal Irrigation
113.2 RM
YRTW
AUGW
BICW
Ahtanum Creek
107.4 RM
106.6 RM
103.0 RM
RSCW
SNCW
Sunnyside Valley Irrigation Project
PARW
Wapato Irrigation Project
DISCLAIMER:
This product is meant as a reference diagram only. Any other use will be the sole responsibility of the user
1:350000
Legend
System Operation Monitoring Stations (River)
System Operation Monitoring Stations (Diversion - Naches)
NWS Flood Forcast
Forcast Runoff
Target Minimum Flows
TWSA
Diversion Dams
Spawning Flows (Other Points); Managed Reach
Spawning Flows (Flip-Flop); Managed Reach
Spawning Flows (Flip-Flop); Affected Reach
Incubation/Rearing; Managed Reach
Incubation/Rearing; Affected Reach
Power Subordination; Managed Reach
Power Subordination; Affected Reach
YRBWEP (Title XII) Targets; April through October
Hydrology
Water Bodies
Flood Control - Effective Reservoirs
Created on: December 03, 2001


Systems Operation Diagram
(SOD) - #3
Keechelus Lake
KEE
YRCW
Kachess Lake
KAC
Cle Elum Lake
EASW
CLE
202.5 RM
KTCW
TNAW
Teanaway River
YUMW
TEAW
Yakima River
Stramp Creek
173.5 RM
KEEW
YRWW
165.5 RM
Teanaway Creek
Kittitas Canal
ETCW
WESW
161.3 RM
Yakima River
Wilson Creek
ELNW
Manastash Creek
YAKIMA
Cherry Creek
CHRW
147.3 RM
Umtanum Creek
UMTW
DISCLAIMER:
This product is meant as a reference diagram only. Any other use will be the sole responsibility of the user
1:425000
RZCW
127.3 RM
RBDW
125.0 RM
Yakima River
3.6 RM
Naches River
ROZW
Roza Canal Irrigation
NRYW
YRTW
113.2 RM
AUGW
EICW
Ahtanum Creek
107.4 RM
RSCW
106.6 RM
103.0 RM
SNCW
Sunnyside Valley Irrigation Project
PAIRW
Wapato Irrigation Project
Legend
System Operation Monitoring Stations (River)
System Operation Monitoring Stations (Diversions - Upper Yakima)
NWS Flood Forcast
Forcast Runoff
Target Minimum Flows
TWSA
Diversion Dams
Spawning Flows (Mini Flip - Flop); Managed Reach
Spawning Flows (Mini Flip - Flop); Affected Reach
Spawning Flows (Flip-Flop); Managed Reach
Spawning Flows (Flip-Flop); Affected Reach
Incubation/Rearing; Managed Reach
Incubation/Rearing; Affected Reach
Power Subordination; Managed Reach
Power Subordination; Affected Reach
YRBWEP (Title XII) Targets; April through October
Hydrology
Water Bodies
Flood Control - Effective Reservoirs
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ESTABLISHMENT OF A PERMANENT PLAN FOR MEASURING & REPORTING

Yakima River Basin
Washington

Report to
Secretary of the Interior

and

State of Washington

From:

Yakima River Basin
Conservation Advisory Group

November 16, 1998

REPORT ON MEASURING & REPORTING

Yakima River Basin
Washington

Report To: Secretary of the Interior and State of Washington

From: Yakima River Basin Conservation Advisory Group

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November 16, 1998

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ESTABLISHMENT OF A PERMANENT PLAN FOR MEASUREMENT AND REPORTING
Yakima River Basin, Washington

The Yakima River Basin Water Enhancement Project (YRBWEP) Conservation Advisory Group (CAG) was directed by Title XII of Pub. Law 103-434 to provide "recommendations to the Secretary and the State of Washington regarding the establishment of a permanent program for the measurement and reporting of all natural flow and contract diversions within the basin."

CAG recognizes the jurisdictional complexities relating to water resource management within the Yakima River basin, including the sovereignty of the Yakama Indian Nation. Implementation of these recommendations will have to be tailored to each different jurisdictional situation. Nothing herein implies State jurisdiction over the water rights of the Yakama Indian Nation.

I. Background

A. Water Supply Problems and Needs

Out of Stream Water Use

Water supplies are not adequate in all years to meet the needs of all Yakima Basin water users. During poor water years, junior-priority water right holders receive a prorated portion of their normal-year water delivery. The amount of proration is determined by the US Bureau of Reclamation (Reclamation) using the total water supply available (TWSA) formula. In 1994, a year of severe shortfall, proratable water users received just 38% of their Federal contract water amount. In the tributaries of the Yakima River, junior-priority water right holders are subject to regulation and curtailment every year to satisfy senior water rights in those subbasins.

An effective program of measuring and reporting of diversion quantities and enforcement is necessary to eliminate illegal water use, to ensure that water users do not exceed their diversion limits, and to curtail junior-priority water rights to satisfy senior water rights, according to the basin's schedule of rights.

Instream Issues

Many of Washington's streams and rivers have insufficient instream flow to support adequate aquatic habitat for fish. In 1996, pursuant to the Federal Clean Water Act, the State Department of Ecology (Ecology) identified 48 stream segments in Washington that have insufficient instream flows to satisfy state water quality standards for, among other things, the provision of adequate

fish habitat. Among those listed were the Yakima mainstem and several of its tributaries, as reported in CAG's Basin Conservation Plan.

In 1992, the Washington State Department of Fish and Wildlife found that 42% of the fish stocks in Washington, whose status could be determined, were either depressed or critical. A depressed fish stock is one whose production is below natural rates. A critical fish stock is one whose production level is so low that permanent damage to the stock is likely or has already occurred. Each of the stream segments in the Yakima Basin listed as having flows too low to support designated salmonid uses under the Clean Water Act was also listed by the Washington Department of Fish and Wildlife as depressed or critical. In addition, the U.S. Fish and Wildlife Service has listed bull trout in the Yakima Basin under the Federal Endangered Species Act. The National Marine Fisheries Service will act on a proposal to list steelhead in the Yakima Basin under the Endangered Species Act in the spring of 1999.

Thus, measuring and reporting water use and effective enforcement against illegal and unauthorized use of water are critical components of the YRBWEP's efforts to improve instream flow conditions in the Yakima River basin.

B. Washington Law on Water Metering

To manage and regulate public waters, the Washington legislature amended RCW 90.03.360 in 1993, requiring that "[t]he owner or owners of any water diversion shall maintain, to the satisfaction of the department of ecology, substantial controlling works and a measuring device constructed and maintained to permit accurate measurement and practical regulation of the flow of water diverted." RCW 90.03.360(1). To implement this mandate, the statute directs Ecology to require metering under certain conditions. Subsection (1) of RCW 90.03.360 provides: "Metering of diversions or measurements by other approved methods shall be required as a condition for all new surface water right permits, and except as provided in subsection (2) of this section, may be required as a condition for all previously existing water rights." Subsection (2) of RCW 90.03.360 provides that "[w]here water diversions are from waters in which the salmonid stock status is depressed or critical, as determined by the department of fish and wildlife, or where the volume of water being diverted exceeds one cubic foot per second, the department shall require metering or measurement by other approved methods as a condition for all new and previously existing water rights or claims."

Subsection (1) makes metering mandatory for all new permits. Metering for existing rights is discretionary unless the diversion falls within the categories described in subsection (2). Subsection (2) mandates metering for all existing rights where diversions are from streams containing depressed or critical salmonid stocks or exceed one cfs. The statute further provides that Ecology's enforcement of the metering requirement for such rights must be prioritized ahead of Ecology's existing compliance workload "where a delay may cause a decline of wild salmonids." RCW 90.03.360(2). In addition, the statute authorizes Ecology to require the owner of a permit or right to file reports documenting the amounts being diverted. RCW 90.03.360.

The metering requirements of RCW 90.03.360 would appear to apply equally to surface and groundwater appropriations. The statutory provisions regulating groundwater, found in RCW 90.44, incorporate and apply the surface code provisions to the groundwater code. RCW 90.44.020 states that "[t]his chapter regulating and controlling groundwaters of the state of Washington shall be supplemental to chapter 90.03 RCW, which regulates the surface waters of the state, and is enacted for the purpose of extending the application of such surface water statutes to the appropriation and beneficial use of ground waters within the state."

Indeed, when Ecology adopted rules to implement the metering statute (WAC 508-64), it explicitly recognized that the metering requirements of RCW 90.03.360 apply equally to both surface and groundwater appropriations. WAC 508-64-010 (Ecology vested with the power to require metering of "those diverting and/or withdrawing waters of the state, both surface and ground") (citing RCW 90.03.360 and RCW 90.44.020).

The rules state that conflicts arising from increased competition for limited water resources make it "necessary to . . . insure that those entitled to make beneficial use of water neither waste water in exercising their rights nor use waters by withdrawal or diversion thereof in amounts in excess to which they are entitled. . . . It has been increasingly apparent that a satisfactory water management program can be carried out only if surface and ground water withdrawals are closely monitored and accurately measured." WAC 508-64-010 (emphasis added).

C. Court Actions in the Yakima Basin Adjudication Concerning Water Metering

The surface water rights in the Yakima River basin are being adjudicated in the State Superior Court of Yakima County. The Court retains jurisdiction, including regulatory jurisdiction, over all claimants to surface water rights in the Yakima River basin, during the adjudication.

Mainstem

The Court ordered, on October 14, 1994 and March 9, 1995, that all persons/entities with diversions of 1 cubic foot per second (cfs) or more from the Yakima, Naches, and Tieton Rivers, install an approved measuring or metering device at each diversion of 1 cfs or greater before March 1, 1995. The Court orders require these mainstem water diverters to measure and report diversion quantities and changes in diversion quantities to Reclamation. The March 9, 1995, order specifically provides for enforcement by Ecology of the measuring requirements. Reclamation or any other party with legal standing in the adjudication could also petition the Court requesting enforcement of these orders (by issuance of a temporary restraining order or other appropriate relief).

Tributary Subbasins

On August 27, 1998, the Court issued another order requiring metering, measuring, and reporting of all diversions from Big Creek, within Subbasin No. 2, and from the Teanaway River

and its tributaries, within Subbasin No. 3. This order was patterned directly after the 1994 and 1995 mainstem orders but includes some modifications. The Court order requires all of these water diverters to measure and report diversion quantities and changes in diversion quantities to Reclamation, commencing in 1999. Reporting requirements do not apply to single families diverting less than 1 cfs of water for purely domestic purposes. The Court appointed a stream patrolman to enforce the provisions of the order.

Effect of the Adjudication on Water Metering, Reporting and Enforcement

The adjudication Court retains jurisdiction over all adjudication claimants during the adjudication. After completion of the adjudication, jurisdiction will return to Ecology (water rights administration) and Reclamation (water contract and Yakima Project administration). The 1994, 1995, and 1998 Court Orders on Metering, Measuring, and Reporting Requirements will expire upon completion of the adjudication.

D. Principles of Effective Enforcement Programs

The way to achieve voluntary compliance in a regulated community is by implementing a strategic enforcement program designed to make the cost of non-compliance greater than that of compliance. Without such an enforcement strategy, voluntary compliance by the vast majority of those subject to the law should neither be expected nor will it be achieved. Government's failure to enforce against illegal water use not only promotes non-compliance in the regulated community at large, but it is simply unfair to those who do comply with the law because it puts them at an economic disadvantage. Moreover, it is important to remember that a fine that is less than the cost of compliance will also promote more widespread non-compliance rather than stem it.

The classic example of an effective enforcement program is that of the Internal Revenue Service. Against their economic interests, millions of Americans voluntarily meet their tax obligations each year. They do so primarily because they hold the belief that if they do not, there is a reasonable chance that their delinquency will be uncovered and the consequences will be vastly more burdensome in economic terms than simply paying their taxes.

An effective enforcement program should be designed to achieve the maximum net benefit for every action taken. An effective strategy is one that induces those subject to legal obligations to fulfill them completely, timely, and at the lowest possible cost to the government. In order to induce that behavior, the government must create a reasonable expectation in those legally obligated that fulfillment of their legal obligations will be less costly than failure to fulfill them. The components of an effective enforcement strategy include:

- Educate the public and obligated community to the importance of its mission and the requirements of the law;

- Effectively detect those who violate those requirements;

- Penalize those individuals so that the cost of non-compliance is greater than the cost of compliance; and

- Effectively publicize the consequences of non-compliance.

By following these principles, the agencies can minimize their enforcement costs and promote fairness among water users, resulting in widespread voluntary compliance.

II. Discussion and Recommendations

CAG believes that a combination of the approaches outlined above is essential to the success of the Yakima River Basin Water Enhancement Project.

A. Recommendation One

CAG believes that all surface water diversions in the Yakima Basin and its tributaries should be metered, monitored, and regulated by stream patrolmen, watermasters, or other regulatory personnel sufficient to ensure that compliance is maintained throughout the irrigation season basin-wide. Compliance staff must:

1) identify all water users not complying with Court ordered measuring and reporting requirements;

2) monitor water use reports to identify users who are exceeding their water rights;

3) take enforcement actions against targeted non-compliers that are designed to promote and maintain voluntary compliance in the rest of the regulated community, consistent with the enforcement principles outlined above in Section ID.

B. Recommendation Two

CAG agrees with the Department of Ecology that "a satisfactory water management program can be carried out only if surface and ground water withdrawals are closely monitored and accurately measured." WAC 508-64-010. Thus, CAG believes that all non-exempt groundwater withdrawals (those requiring water right permits under RCW 90.44.050) in the Yakima Basin should be metered, monitored and reported.

C. Recommendation Three

CAG also believes that good water management requires the ability to meter and monitor water use to allow for the adoption of incremental water pricing structures. Thus, CAG recommends that metering be extended to each farm delivery point and/or to each individual ownership, where practicable.

D. Recommendation Four

CAG believes that streamflow gages must be adequate to measure progress in complying with YRBWEP needs as well as a number of other Federal and State laws and obligations that Reclamation and Ecology are subject to (e.g. the Clean Water Act and the Endangered Species Act). CAG recommends that Ecology and Reclamation cooperate in quickly assessing where additional streamflow gages are necessary to insure that streamflow can be measured to meet the needs of these various Federal and State obligations.

E. Recommendation Five

Reclamation and Ecology should jointly petition the adjudication Court to extend its 1998 Order on Metering, Measuring, and Reporting Requirements as necessary, to other subbasins or water users, consistent with the recommendations above.

F. Recommendation Six

Because after the completion of the adjudication, jurisdiction over water use metering, reporting and enforcement returns to Ecology and Reclamation, they should petition the Court to issue an Order on Metering, Measuring, and Reporting Requirements as indicated above, applicable basin-wide, as part of the final Yakima Adjudication Decree.

G. Recommendation Seven

Both during and after the completion of the Adjudication, Ecology and Reclamation should cooperate in establishing an effective water use metering, monitoring and enforcement program with effective deterrents to non-compliance consistent with the enforcement principles outlined in Section ID above. The agencies should give this program the highest priority, as it protects those water users who comply with their water rights from harm by those who may not, and puts them on an equal economic footing. Allowing non-compliance to go undetected and unpunished puts those who comply at an economic disadvantage, and thus promotes more widespread non-compliance.

These agencies have several tools available for designing such an enforcement strategy. For instance, Section 90.03.600 RCW provides Ecology authority to issue civil penalties for violations of the surface water code or of regulatory orders issued by Ecology; Section 90.44.500 RCW applies the civil penalty authority granted to Ecology by 90.03.600 RCW to the ground water code; Section 43.27A.190 RCW authorizes Ecology to issue regulatory orders where it finds violations of the state surface and ground water codes; and Chapter 90.08 RCW authorizes Ecology to appoint a stream patrolman for adjudicated streams and establishes procedures for compensation of the stream patrolman by the water users. Reclamation has the authority to enforce the provisions of its Federal water delivery contracts with Yakima Project water users.

LEGAL

REFERENCES

WASHINGTON STATE

LAWS & REGULATIONS

LAWS AND REGULATIONS – WATER RESOURCES
PART OF CHAPTER 43.27A RCW
WATER CODE

RCW 43.27A.190 Water resource orders. Notwithstanding and in addition to any other powers granted to the department of ecology, whenever it appears to the department that a person is violating or is about to violate any of the provisions of the following:

(1) Chapter 90.03 RCW; or

(2) Chapter 90.44 RCW; or

(3) Chapter 86.16 RCW; or

(4) Chapter 43.37 RCW; or

(5) Chapter 43.27A RCW; or

(6) Any other law relating to water resources administered by the department; or

(7) A rule or regulation adopted, or a directive or order issued by the department relating to subsections (1) through (6) of this section; the department may cause a written regulatory order to be served upon said person either personally, or by registered or certified mail delivered to addressee only with return receipt requested and acknowledged by him. The order shall specify the provision of the statute, rule, regulation, directive or order alleged to be or about to be violated, and the facts upon which the conclusion of violating or potential violation is based, and shall order the act constituting the violation or the potential violation to cease and desist or, in appropriate cases, shall order necessary corrective action to be taken with regard to such acts within a specific and reasonable time. The regulation of a headgate or controlling works as provided in RCW 90.03.070, by a watermaster, stream patrolman, or other person so authorized by the department shall constitute a regulatory order within the meaning of this section. A regulatory order issued hereunder shall become effective immediately upon receipt by the person to whom the order is directed, except for regulations under RCW 90-.03.070 which shall become effective when a written notice is attached as provided therein. Any person aggrieved by such order may appeal the order pursuant to RCW 43.21B.310. [1987 c 109 § 11; 1969 ex s. c 284 § 7.]

LAWS AND REGULATIONS – WATER RESOURCES
PART OF CHAPTER 90.03 RCW
WATER CODE

RCW 90.03.360 Controlling works and measuring devices--Metering of diversions--Impact on fish stock. (1) The owner or owners of any water diversion shall maintain, to the satisfaction of the department of ecology, substantial controlling works and a measuring device constructed and maintained to permit accurate measurement and practical regulation of the flow of water diverted. Every owner or manager of a reservoir for the storage of water shall construct and maintain, when required by the department, any measuring device necessary to ascertain the natural flow into and out of said reservoir.

Metering of diversions or measurement by other approved methods shall be required as a condition for all new surface water right permits, and except as provided in subsection (2) of this section, may be required as a condition for all previously existing surface water rights. The department may also require, as a condition for all water rights, metering of diversions, and reports regarding such metered diversions as to the amount of water being diverted. Such reports shall be in a form prescribed by the department.

(2) Where water diversions are from waters in which the salmonid stock status is depressed or critical, as determined by the department of fish and wildlife, or where the volume of water being diverted exceeds one cubic foot per second, the department shall require metering or measurement by other approved methods as a condition for all new and previously existing water rights or claims. The department shall attempt to integrate the requirements of this subsection into its existing compliance workload priorities, but shall prioritize the requirements of this subsection ahead of the existing compliance workload where a delay may cause the decline of wild salmonids. The department shall notify the department of fish and wildlife of the status of fish screens associated with these diversions.

This subsection (2) shall not apply to diversions for public or private hatcheries or fish rearing facilities if the diverted water is returned directly to the waters from which it was diverted. [1994 c 264 § 85; 1993 sp.s. c 4 § 12; 1989 c 348 § 6; 1987 c 109 § 92; 1917 c 117 § 37; RRS § 7389. Formerly RCW 90.28.070.]

NOTES:

Findings--Grazing lands--1993 sp.s. c 4: See RCW 79.01.2951.

Severability--1989 c 348: See note following RCW 90.54.020.

Rights not impaired--1989 c 348: See RCW 90.54.920.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

Instream flows: RCW 90.22.060.

RCW 90.03.600 Civil penalties. Except as provided in RCW 43.05.060 through 43.05.080 and 43.05.150, the power is granted to the department of ecology to levy civil penalties of up to one hundred dollars per day for violation of any of the provisions of this chapter and chapters 43.83B, 90.22, and 90.44 RCW, and rules, permits, and similar documents and regulatory orders of the department of ecology adopted or issued pursuant to such chapters. The procedures of RCW 90.48.144 shall be applicable to all phases of the levying of a penalty as well as review and appeal of the same. [1995 c 403 § 635; 1987 c 109 § 157; 1977 ex.s. c 1 § 8. Formerly RCW 43.83B.335.]

NOTES:

Findings--Short title--Intent--1995 c 403: See note following RCW 34.05.328.

Part headings not law--Severability--1995 c 403: See RCW 43.05.903 and 43.05.904.

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

LAWS AND REGULATIONS – WATER RESOURCES
PART OF CHAPTER 90.44 RCW
WATER CODE

RCW 90.44.020 Purpose of chapter. This chapter regulating and controlling ground waters of the state of Washington shall be supplemental to chapter 90.03 RCW, which regulates the surface waters of the state, and is enacted for the purpose of extending the application of such surface water statutes to the appropriation and beneficial use of ground waters within the state. [1945 c 263 § 1; Rem. Supp. 1945 § 7400-1.]

RCW 90.44.050 Permit to withdraw. After June 6, 1945, no withdrawal of public ground waters of the state shall be begun, nor shall any well or other works for such withdrawal be constructed, unless an application to appropriate such waters has been made to the department and a permit has been granted by it as herein provided: EXCEPT, HOWEVER, That any withdrawal of public ground waters for stock-watering purposes, or for the watering of a lawn or of a noncommercial garden not exceeding one-half acre in area, or for single or group domestic uses in an amount not exceeding five thousand gallons a day, or for an industrial purpose in an amount not exceeding five thousand gallons a day, is and shall be exempt from the provisions of this section, but, to the extent that it is regularly used beneficially, shall be entitled to a right equal to that established by a permit issued under the provisions of this chapter: PROVIDED, HOWEVER, That the department from time to time may require the person or agency making any such small withdrawal to furnish information as to the means for and the quantity of that withdrawal: PROVIDED, FURTHER, That at the option of the party making withdrawals of ground waters of the state not exceeding five thousand gallons per day, applications under this section or declarations under RCW 90.44.090 may be filed and permits and certificates obtained in the same manner and under the same requirements as is in this chapter provided in the case of withdrawals in excess of five thousand gallons a day. [1987 c 109 § 108; 1947 c 122 § 1; 1945 c 263 § 5; Rem. Supp. 1947 § 7400-5.]

NOTES:

Purpose--Short title--Construction--Rules--Severability--Captions--1987 c 109: See notes following RCW 43.21B.001.

RCW 90.44.500 Civil penalties. See RCW 90.03.600.

Chapter 90.08 RCW
STREAM PATROLMEN

Sections

90.08.040 Stream patrolmen——Appointment——Powers.
90.08.050 Stream patrolmen——Compensation, travel expenses.
90.08.060 Stream patrolmen——Users to share in payment of compensation.
90.08.070 Right of county to sue user for unpaid share of expenses.

RCW 90.08.040 Stream patrolmen——Appointment——Powers. Where water rights of a stream have been adjudicated a stream patrolman shall be appointed by the director of the department of ecology upon application of water users having adjudicated water rights in each particular water resource making a reasonable showing of the necessity therefor, which application shall have been approved by the district water master if one has been appointed, at such time, for such stream, and for such periods of service as local conditions may indicate to be necessary to provide the most practical supervision and to secure to water users and owners the best protection in their rights.

The stream patrolman shall have the same powers as a water master appointed under RCW 90.03.060, but his district shall be confined to the regulation of waters of a designated stream or streams. Such patrolman shall be under the supervision of the director or his designated representative. He shall also enforce such special rules and regulations as the director may prescribe from time to time. [1977 c 22 § 1; 1925 ex.s. c 162 § 1; RRS § 7351–1.]

Water masters
appointment, compensation: RCW 90.03.060.
duties: RCW 90.03.070.
power of arrest: RCW 90.03.090.

RCW 90.08.050 Stream patrolmen——Compensation, travel expenses. Each stream patrolman shall receive a wage per day for each day actually employed in the duties of his office, or if employed by the month, he shall receive a salary per month, which wage or salary shall be fixed in the manner provided by law for the fixing of the salaries or compensation of other state officers or employees, plus travel expenses in accordance with RCW 43.03.050 and 43.03.060 as now existing or hereafter amended, to be paid by the county in which the work is performed. In case the service extends over more than one county, each county shall pay its equitable part of such wage to be apportioned by the director. He shall be reimbursed for actual necessary expenses when absent from his designated headquarters in the performance of his duties, such expense to be paid by the county in which he renders the service. The accounts of the stream patrolman shall be audited and certified by the director and the county auditor shall issue a warrant therefor upon the current expense fund. [1977 c 22 § 2; 1975–'76 2nd ex.s. c 34 § 180; 1947 c 123 § 1; 1925 ex.s. c 162 § 2; Rem. Supp. 1947 § 7351–2.]

Effective date——Severability——1975–'76 2nd ex.s. c 34: See notes following RCW 2.08.115.

Public officers, salaries and fees: Chapter 42.16 RCW.

State government, salaries and expenses: Chapter 43.03 RCW.

RCW 90.08.060 Stream patrolmen——Users to share in payment of compensation. The salary of the stream patrolman shall be borne by the water users receiving the benefits and shall be paid to the county or counties in the following manner:

The county or counties may assess each water user for his proportionate share of the total stream patrolman expense in the same ratio that the amount of water diverted by him bears to the total amount diverted from the stream during each season, on an annual basis, to recover all such county expenses. The stream patrolman shall keep an accurate record of the amount of water diverted by each water user coming under his supervision. On the first of each month the stream patrolman shall present his record of water diversion to the county or counties for the preceding month. Where the water users are organized into an irrigation district or water users' association, such organization may enter into an agreement with the county or counties for direct payment to the stream patrolman in order to minimize administrative costs. [1977 c 22 § 3; 1925 ex.s. c 162 § 3; RRS § 7351–3.]

Irrigation districts generally: Chapter 87.03 RCW.

RCW 90.08.070 Right of county to sue user for unpaid share of expenses. Upon failure of any water user to pay his proportionate share of the expense referred to in RCW 90.08.050 and 90.08.060, the county or counties shall be entitled to sue for and recover any such unpaid portion in any court of competent jurisdiction. [1977 c 22 § 4; 1925 ex.s. c 162 § 4; RRS § 7351–4.]

Chapter 508-64 WAC
MEASURING DEVICES FOR WATER DIVERSION AND WITHDRAWAL FACILITIES

WAC

508-64-010 Background and purpose of regulation.
508-64-020 Meter specifications.
508-64-030 Meter installation requirements.
508-64-040 Meter operation and maintenance.
508-64-050 Meter—When required.
508-64-060 Unauthorized diversion or withdrawals—Enforcement agent.
508-64-070 Appeals.
508-64-080 Regulation review.

WAC 508-64-010 Background and purpose of regulation. With the passage of time and issuance of an additional number of water rights in each year, competition for rights to use of our limited water resources increases. Conflicts also develop where uses presently authorized compete for water supplies which may vary on seasonal or annual bases, due to changes in hydrologic conditions. For these reasons it becomes necessary to manage our state's water resources so as to insure that those entitled to make beneficial use of water neither waste water in exercising their rights nor use waters by withdrawal or diversion thereof in amounts in excess to that which they are entitled.

One of the tools of water management vested in the department of ecology is the power to require that those diverting and/or withdrawing waters of the state, both surface and ground, provide a measuring device so as to provide for accurate measurement of waters so utilized. See RCW 90.03.360 and 90.44.020. It has been increasingly apparent that a satisfactory water management program can be carried out only if surface and ground water withdrawals are closely monitored and accurately measured.

Under RCW 43.27A.090(11), the department of ecology is authorized to adopt such regulations as are necessary to carry out the provisions of the surface and ground water statutes of chapters 90.03 and 90.44 RCW. Acting under the authority of RCW 43.27A.090(11) and 90.03.360, the following regulation is adopted for the purpose of setting forth:

(1) The specifications for meters installed on water withdrawal facilities for pressure systems;

(2) The installation requirements for a meter;

(3) The operation and maintenance requirements for a meter; and

(4) The procedures the department of ecology will follow in determining when installation of a meter shall be required and how notification of this requirement shall be given to the water user. [Statutory Authority: Chapters 43.21A, 43.27A and 90.44 RCW. 88-13-037 (Order 88-11), § 508-64-010, filed 6/9/88; Order DWR 69-9, § 508-64-010, filed 11/6/69.]

WAC 508-64-020 Meter specifications. All meters required to be installed, as provided under WAC 508-64-010, shall meet the following requirements:

(1) Meters shall be of the velocity propeller type with enclosed propeller made of noncorrosive materials. Positive displacement and other types of meters may be used with the express approval of the department of water resources. All meters shall be line meters. For pressures in excess of 100 pounds per square inch, high pressure welded saddle or tube type meters shall be required. Meters shall be complete with meter head, register box with locking hasp, and straightening vanes for attachment to existing pipe or contained within a tube. The saddle or tube-type meters shall be of a construction such that any part of the propeller gears, shafts, totalizer, or any other moving part can be removed for repair with relative ease. The saddle-type meter shall be designed and constructed so as to be suitable for welding to the existing or installed steel pipe but with removable meter-head or designed so that it may be secured to the pipe by anchor bars welded to the pipe with U-bolts, or with threaded straps. All meters shall have the size, serial number, and direction of the flow through the meter properly and clearly indicated.

(2) The meter shall have a rated accuracy of plus or minus 2 percent of actual flow for all rates of flow within the range of flow for which the meter is designed. The meter shall register the full range of discharge from the source of water for which it is to be used.

(3) The meter shall have a visual, mechanical, digital totalizer located on or adjacent to the meter. The register shall be protected.

(4) Units of measurement for irrigation uses shall be in acre-feet. The totalizer shall read directly in acre-feet with six digits to read to the nearest hundredths (0000.00). Both the register and meter unit shall be provided with a method of sealing with a wire or lead seal to prevent unauthorized tampering. For other uses, different units of measurement may be used with the express approval of the department of water resources. All totalizers or registers shall be equipped with a sweep hand with adequate markings or divisions for test purposes.

(5) Register boxes – the register box shall have a protective hinged cover over the window glass. Register box screws shall be drilled for seal wire holes.

(6) Propeller – the propeller shall be made of polyethylene or equivalent corrosion-resistant material and such that it will operate effectively and without distortion at temperatures between 32 degrees and 100 degrees Fahrenheit. The propeller shall be located in the center of the pipe and normal to the centerline of flow.

The measuring propeller, together with its spindle, shall be the same specific gravity as water or less. [Order DWR 69-9, § 508-64-020, filed 11/6/69.]

WAC 508-64-030 Meter installation requirements. Meters required to be installed, as provided under WAC 508-64-010, shall meet the following installation requirements:

(1) The meter shall be installed in accordance with manufacturer specifications and in such a manner that there shall be a full pipe of water at all times when water is being withdrawn.

(2) Straightening vanes shall be installed in the pipe in the manner recommended by the manufacturer of the meter, or vanes may be part of the tube furnished with tube-type meters or separate units for installation in the discharge pipe upstream of the meter.

(3) There shall be no turnouts or diversions between the source of water and the meter installation, except for faucet or other similar small outlets.

(4) The meter shall be placed in the pipe not less than five pipe diameters downstream from any valves, elbows, or other obstructions which might create turbulent flow, or as recommended by the meter manufacturer. There shall also be at least one pipe diameter of unobstructed flow on the downstream side of the meter.

(5) The meter and register shall not be enclosed in a building or structure in such a manner as to prevent access to the register. The register or meter shelter may be equipped with a lock to prevent tampering or breakage, provided that a key is made available to authorized employees of the department of ecology at the place of business during normal working hours or at the residence in case of private parties.

(6) Provisions shall be made for removal and rating of the meter in accordance with the manufacturer's specifications.

(7) In those cases where wells are authorized for the purpose of supplementing surface waters with water from combined sources not to exceed a total quantity, both sources of water shall be metered.

(8) In the case of artesian wells which flow at times, the meter shall be installed in a manner which will measure both pumped and flowing discharge.

(9) The owner shall cause the department of ecology to be notified within ten days from the installation of the meter.

(10) The meter installation shall be inspected and approved by the department of ecology. [Statutory Authority: Chapters 43.21A, 43.27A and 90.44 RCW. 88-13-037 (Order 88-11), § 508-64-030, filed 6/9/88; Order DWR 69-9, § 508-64-030, filed 11/6/69.]

WAC 508-64-040 Meter operation and maintenance. Meters installed hereunder shall be operated and maintained in accordance with the following:

(1) No withdrawal or diversion of water shall be made unless the meter installation has been inspected and approved by the department of ecology and is in proper operating condition.

(2) Meters shall be repaired and returned to operation as soon as possible upon discovery of a malfunctioning meter. The department of ecology shall be notified immediately of such malfunctioning meter. In all cases the meter reading immediately prior to repair and the reading of the new or repaired meter shall be submitted to the department of ecology on forms provided within ten days following reinstallation of the meter and/or meter head.

(3) Water use data shall be submitted to the department of ecology on forms provided for that purpose at such times as may be required by the department.

(4) Meters shall be kept clear of debris or any other material or vegetative growth which would impede their operation. All meters shall be lubricated as specified by the manufacturer.

(5) Meters which are not properly operated and maintained shall be repaired or replaced upon order of the department of ecology within the time specified within said order. [Statutory Authority: Chapters 43-.21A, 43.27A and 90.44 RCW. 88-13-037 (Order 88-11), § 508-64-040, filed 6/9/88; Order DWR 69-9, § 508-64-040, filed 11/6/69.]

WAC 508-64-050 Meter—When required. Meters shall be installed on water diversion and/or withdrawal facilities existing prior to or constructed subsequent to the effective date hereof whenever it shall appear to the department of ecology that one of the following conditions exist:

(1) The need exists to accurately measure the instantaneous rate of diversion (withdrawal) and/or the total water use by a facility operating over a specified period of time, for purposes of determining if the quantities of water utilized are within the limits of the established rights, or

(2) Studies, inventories and investigations of stream and/or aquifer systems are being conducted by the department of ecology for purposes of determining location, extent, depth, volume and flow of said waters for planning, utilization and management purposes; and accurate determination of existing diversion and/or withdrawals is necessary for proper conduct of such studies, inventories and investigations, or

(3) When it has been established by the department of ecology, or there is reasonable reason to believe that a mining of ground waters is taking place within a defined area and that an accurate determination as to the extent of existing use of ground waters is necessary to properly manage such use for the purpose of maintaining a reasonable or feasible pumping lift (or reasonable or feasible reduction of artesian pressure) within the defined area, or

(4) Conflict in use under established rights exist and accurate determination of the rate of diversion (withdrawal) and/or volumetric use over a given period of time is necessary for a proper resolution of the conflict.

The requirement that a meter shall be installed on an existing facility shall be given by written notice served upon the owner or person having control thereof, as appropriate, personally or by registered or certified mail.

COURT

ORDERS

9-192-D (Rev. Dec. 1994) Diversion Code _____

Daily Diversion, in Cubic Feet, per Second, of _____

for the Water Year commencing October 1, 19____ , ending September 30, 19____

IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
FOR YAKIMA COUNTY

NO. 77-201484-5

ORDER PENDENTE LITE REGARDING METERING, MEASUREMENT AND REPORTING REQUIREMENTS

THIS matter having come before the Court on the Plaintiff's Petition for Pendente Lite Regarding Reporting Requirements, the Court having heard from all interested parties and being fully advised; now, therefore, it is hereby

ORDERED, ADJUDGED, AND DECREED that all persons/entities with diversions of 1 cfs or more from the Yakima, Naches, and Tieton Rivers, shall install an approved measuring or metering device at each diversion of 1 cfs or greater before March 1, 1995. An approved metering or measurement device shall be a (1) standard weir structure, (2) parshall flume(s), (3) velocity type meter, (4) pump flow-meter (5) stable rated section with a rating table, provided the rated section has a stable control, the staff gage is readable throughout the full range of flows experienced in a water year, and monthly flow measurements are made to verify the rating table and to determine shifts if necessary; or (6) other device capable of measuring flow within plus or minus 5%.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that records of the diversions shall be kept on a Standard Form 192 (attached and incorporated as part of this order) showing the average daily gage height and flow for each day of the water season.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED that diversion records required to be kept by this order shall be provided to the Bureau of Reclamation weekly, and the Bureau of Reclamation shall provide the records to the Department of Ecology.

IT IS FURTHER ORDERED, ADJUDGED AND DECREED that an annual summary of diversions shall be provided to the Bureau of Reclamation by November 1 of each year.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that all persons/entities with diversions of 2 cfs or more from the Yakima, Naches, and Tieton Rivers shall report to the Bureau of Reclamation any planned diversions, either plus or minus, in excess of 23 cfs or 2% whichever is greater, by telephoning (509)454-5621 or (509) 575-5854 (from 8:00 a.m. - 4:30 p.m. weekdays and 8:00 a.m. - 10:00 a.m. on weekends) at least 48 hours prior to making said changes.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that all persons/entities with diversions of 2 cfs or more from the Yakima, Naches, and Tieton Rivers shall report any unplanned changed in diversions, which are either plus or minus, 2 cfs or 2% whichever is greater by telephoning (509)454-5621 or (509)575-5854 (from 8:00 a.m. - 4:30 p.m. weekdays and 8:00 a.m. - 10:00 a.m. on weekends) as soon as possible after the change.

IT IS FINALLY ORDERED, ADJUDGED AND DECREED that this order is not intended to apply to diversions within the Yakima Reservation.

DONE IN OPEN COURT this 13th day of October, 1994.

/s/ Honorable Walter A. Stauffacher

9-192-D (Rev. Dec. 1994) Diversion Code _____

Daily Diversion, in Cubic Feet, per Second, of _____

for the Water Year commencing October 1, 19____ and ending September 30, ____

Gage/meter read to _____ once/twice a day by _____ (Observer)

Phone: _____

Day	October		November		December		January		February		March		Day
	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	
1													1
2													2
3													3
4													4
5													5
6													6
7													7
8													8
9													9
10													10
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28													28
29													29
30													30
31													31
Total													
Mean													
Maximum													
Minimum													

Acre-feet													

9-192-D (Rev. Dec. 1994) Diversion Code _____

Daily Diversion, in Cubic Feet, per Second, of _____

for the Water Year commencing October 1, 19____ , ending September 30, 19____

ADJUDICATION
Yakima River Drainage Basin
Sub-basin

RCW 90.03.360 Controlling works and measuring devices --- Metering of diversions. The owner or owners of any ditch or canal shall maintain to the satisfaction of the Department of Ecology, substantial controlling works, and a measuring device at the point where water is diverted, and these shall be so constructed and maintained as to permit accurate measurement, practical regulation of the flow of water diverted into said ditch or canal. Every owner or manager of a reservoir for the storage of water shall construct and maintain, when required by the Department, any measuring device necessary to ascertain the natural flow into and out of said reservoir.

Metering of diversions or measurement by other approved methods may be required as a condition for all new water right permits. The Department may also require, as a condition for such permits, reports regarding such metered diversions as to the amount of water being diverted. Such reports shall be in a form prescribed by the Department [1989 c 348 ¶ 6: 1987 c 109 ¶ 92: 1989 c 117 ¶ 37; RRS ¶ 7389. Formerly RCW 90.28.070.]

Severability — 1989 c 348: See note following RCW 90.54.020.
Rights not impaired — 1989 c 348: See RCW 90.54.920.
Purpose — Short title — Construction — Rules —Severability — Captions — 1987 c 109: See notes following RCW 43.21B.001.

WAC 508-12-030 Regulation of water right diversions --- Controlling works --- Measuring devices. Where controlling works or measuring devices are not installed or maintained to the satisfaction of the Department of Ecology, proper notice shall be given to the owner to install or repair such controlling works or measuring device. This notice shall allow not less than ten days time to make necessary repairs or installations. In the event the work outlined in the notice is not completed in the specified time, the diversion shall be closed to further flow of water, until such time as the notice has been fully/complied with. [Statutory Authority: Chapter 43-.27A RCW. 88-13-037 (Order 88-11), ¶ 508-12-030. filed 6/9/88: Rule 3, filed 3/23/60. Formerly WAC 134-12-030.]

WAC 508-12-040 Regulation of water right diversions--Controlling works--Headgates. Controlling works or headgates shall be so constructed that they can be regulated and locked in place by the watermaster or stream patrolman. [Rule 4, filed 3/23/60. Formerly WAC 134-12-040.]

Diversion's measuring device must be located within a minimal distance from initial point of diversion from the river/creek/canal, below fishscreen return flow, above diversion's consumptive use, and above any significant system conveyance loss. Site approved by project hydrologic engineer.

Diversion records (copy of Form 192) shall be provided/mailed weekly to the Bureau of Reclamation, Yakima Field Office, Hydrology, P.O. Box 1749, Yakima, WA 98907.

Diversion changes shall be reported at least 48 hours prior to making said changes. Report changes by telephoning (509)454-5621 (from 08:00 a.m. - 4:30 p.m. weekdays and 8:00 - 10:00 a.m. on weekends) or after hours at (509) 575-5854 (leave message on recorder).

9-1920 (Rev. Dec. 1994)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
HYDROLOGY

Diversion Code _____
Diversion _____
Water Year _____

Day	April		May		June		July		August		September		Day
	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	
1													1
2													2
3													3
4													4
5													5
6													6
7													7
8													8
9													9
10													10
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31													31

Fourth
Third
Second
First
Quarter
Computed
Checked

Fourth
Third
Second
First
Quarter
Disch. applied
Disch. checked

Fourth
Third
Second
First
Quarter
G. H. copied
G. H. checked

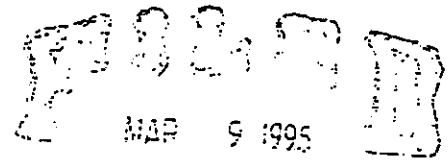
Period
Year

ORIGINAL

Ec

RECEIVED

'95 MAR 9 AM 10 37



KIM M. EATON, YAKIMA COUNTY CLERK

IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON

FOR THE COUNTY OF YAKIMA

IN THE MATTER OF THE DETERMINATION OF THE RIGHTS TO THE USE OF THE SURFACE WATERS OF THE YAKIMA RIVER DRAINAGE BASIN, IN ACCORDANCE WITH THE PROVISIONS OF CHAPTER 90.03, REVISED CODE OF WASHINGTON, STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY, Plaintiff, vs. JAMES J. ACQUAVELLA, et al., Defendants.	NO.: 77-2-01484-5 ~~[PROPOSED]~~ ORDER ON PENDENTE LITE RE: ENFORCEMENT OF ORDER PENDENTE LITE REGARDING METERING, MEASURING AND REPORTING REQUIREMENTS

This matter having come before the Court on the Petitioners', State of Washington, Department of Ecology, and United States, Bureau of Reclamation, Petition for Order Pendente Lite Re: Enforcement of Order Pendente Lite Regarding Metering, Measuring and Reporting Requirements, the Court having heard from all interested parties and being fully advised; now, therefore, it is hereby

ORDERED ADJUDGED, AND DECREED that in the event that any person/entity that diverts 1 cfs or more water from the Yakima, Naches or Tieton Rivers fails to install an approved measuring

10,456

ATTORNEY GENERAL OF WASHINGTON
Ecology Division
PO Box 40117
Olympia, WA 98504-0117
FAX (360) 438-7743

or metering device at the diversion by March 1, 1995, the Department of Ecology shall notify the person/entity that they must install an approved metering or measurement device as identified in the Court's Order Pendente Lite Regarding Metering, Measurement and Reporting Requirements within one (1) month of the date of the Notice. The Notice shall be in writing and be posted at the person/entity's point of diversion or personally delivered to the person or any individual who represents the entity. A copy of the Notice shall be filed with the Department of Ecology and the Bureau of Reclamation at the agency offices in Yakima; and,

IT IS FURTHER ORDERED, ADJUDGED AND DECREED that any person/entity who fails to comply within one (1) month of the date of the Notice shall be considered to be in violation of the Court's Order dated October 14, 1994. The Department of Ecology shall issue a cease and desist order to the person/entity ordering them to terminate the diversion unless and until the person/entity installs an approved metering or measuring device and notifies Ecology of such installation. The cease and desist order shall be served by registered mail or personally upon the person, or any individual who represents the entity to whom the order is directed. A copy of the cease and desist order shall be filed with the Department of Ecology and with the Bureau of Reclamation at the agency offices in Yakima. Any person/entity who fails to comply with the cease and desist order will be subject to all enforcement and penalty orders available to

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Ecology Division
PO Box 40117
Olympia, WA 98504-0117
FAX (360) 438-7743

Ecology, including penalties issued pursuant to RCW 90.03.600. The order may be appealed only to the Pollution Control Hearings Board as provided in RCW 43.21B.310. During the pendency of this action, any appeal from a decision of the Pollution Control Hearings Board shall be heard by the Presiding Judge of this case.

DONE IN OPEN COURT this 9th day of March, 1995.

Walter Stauffacher
WALTER A. STAUFFACHER, JUDGE

Presented by:

CHRISTINE O. GREGOIRE
Attorney General

Mary E. McCrea

MARY E. McCREA, WSBA #20160
Assistant Attorney General
Attorneys for Plaintiff
State of Washington
Department of Ecology
(360) 459-6155

Mary E. McCrea for

CHARLES O'CONNELL
Attorney for Defendant
U.S. Department of Justice
Land & Natural Resources Div.
Indian Resources Section
(202) 272-4210

[t2\acquavella\metering.ord]

IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF YAKIMA

IN THE MATTER OF THE DETERMINATION OF THE RIGHTS TO THE USE OF THE SURFACE WATERS OF THE YAKIMA RIVER DRAINAGE BASIN, IN ACCORDANCE WITH THE PROVISIONS OF CHAPTER 90.03 REVISED CODE OF WASHINGTON, STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY, Plaintiff, v. JAMES J. ACQUAVELLA et al., Defendants.	NO. 77-2-01484-5 **CERTIFICATE OF SERVICE**

The undersigned hereby certifies that she is an employee at the Bureau of Reclamation, of the United States Department of the Interior, 1917 Marsh Road, Yakima, Washington, 98901; over the age of eighteen years, not a party to or interested in the above-entitled action and competent to be a witness therein.

I certify that on this 2nd day of September 1998, I caused to be served a true and correct copy of the following:

1) **Order Pendente Lite Re: Metering, Measuring, and Reporting Requirements,** Teanaway River and Big Creek, Kittitas County; and,
2) **Letter from Jim Esget transmitting Order Pendente Lite and introducing Stan Isley, Court Appointed stream patrolman** for Teanaway River and Big Creek, Kittitas County,
3) **Photograph of Stan Isley;** and,
4) **SF-192,** form for reporting diversion quantities.

by causing said copies to be served on all necessary parties pursuant to the requirements of PRETRIAL ORDER NO. 6.

I have provided, by certified mail, a copy of the above documents to:

Each of the water right claimants of record for Subbasin #2.
Each of the water right claimants of record for Subbasin #3.
All Major Claimants.

I have provided, by regular mail, a copy of this set of documents to each of the attorneys and agents of record in the above entitled matter.

Sally LeBeau
for the US Bureau of Reclamation
September 2, 1998

IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF YAKIMA

IN THE MATTER OF THE DETERMINATION OF THE RIGHTS TO THE USE OF THE SURFACE WATERS OF THE YAKIMA RIVER DRAINAGE BASIN, IN ACCORDANCE WITH THE PROVISIONS OF CHAPTER 90.03, REVISED CODE OF WASHINGTON,

STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY,

Plaintiff,

v.

JAMES J. ACQUAVELLA, ET AL.,

Defendant.

NO. 77-2-01484-5

ORDER PENDENTE LITE RE: METERING, MEASURING AND REPORTING REQUIREMENTS, TEANAWAY RIVER AND BIG CREEK, KITTITAS COUNTY

THIS MATTER having come before the Court on the Petitioner's, United States Bureau of Reclamation, Petition for Order Pendente Lite Re: Metering, Measuring, and Reporting Requirements, Teanaway River and Big Creek, Kittitas County, the Court having heard from all interested parties and being fully advised; now, therefore,

IT IS ORDERED, ADJUDGED, AND DECREED that all persons diverting water from the Teanaway River or its tributaries (Subbasin No. 3) or from Big Creek (within Subbasin No. 2) shall install an approved metering or measuring device at each of their diversion points by May 1, 1999. An approved metering or measuring device shall be a: 1) standard weir structure; 2) Parshall flume; 3) velocity type meter; 4) pump flow meter; 5) stable rated section with a rating

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Ecology Division
PO Box 40117
Olympia, WA 98504-0117
FAX (360) 438-7743

table, provided the rated section has a stable control, the staff gage is readable throughout the full range of flows experienced in a water year, and monthly flow measurements are made to verify the rating table and to determine shifts if necessary; or 6) other device capable of measuring flow within plus or minus five percent (5%).

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that records of the diversions shall be kept on a Standard Form 192 (attached and incorporated as part of this Order) showing the average daily gage height and flow for each day of the water use season. This record keeping requirement does not apply to single families diverting less than 1 cfs for purely domestic purposes.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that diversion records required to be kept by this Order as to all diversions greater than 1 cfs shall be provided to the Bureau of Reclamation weekly, and the Bureau of Reclamation shall provide the records to the Department of Ecology. This reporting requirement does not apply to single families diverting less than 1 cfs for purely domestic purposes.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that an annual summary of diversions shall be provided to the Bureau of Reclamation by November 1 of each year. This reporting requirement does not apply to single families diverting less than 1 cfs for purely domestic purposes.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that all persons/entities with diversions of 2 cubic feet per second (cfs) or more from the Teanaway River or its tributaries or from Big Creek, shall report to the Bureau of Reclamation any changes in diversion quantities, either plus or minus, of 2 cfs or more, by telephoning (509) 575-5848 ext. 219 or (509) 575-5854 (from 8:00 AM to 4:30 PM weekdays and 8:00 AM to 10:00 AM on weekends). Planned diversion changes shall be reported at least 48 hours prior to making said changes. Unplanned diversion changes shall be reported as soon as possible after the change.

ATTORNEY GENERAL OF WASHINGTON
Ecology Division
PO Box 40117
Olympia, WA 98504-0117
FAX (360) 438-7743

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that each diversion metering or measuring device shall be located within a minimal distance from the point of diversion from the river/water source; below the fish screen return flow point, if applicable; above the diversion's consumptive use; and above any significant system conveyance loss. The site must be approved by the Department of Ecology and the Bureau of Reclamation.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that in the event that any person/entity who diverts water from the Teanaway River or its tributaries or from Big Creek fails to install an approved metering or measuring device at each diversion point by May 1, 1999, the Department of Ecology shall notify the person/entity that he/she shall install an approved metering or measuring device within one (1) month of the date of the notice. The notice shall be in writing and be posted at the person/entity's point of diversion or personally delivered to the person or any individual who represents the entity. A copy of the notice shall be filed with the Department of Ecology and the Bureau of Reclamation at the agency offices in Yakima.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that any person/entity who fails to comply within one (1) month of the date of the notice shall be considered to be in violation of this Court Order.

The Bureau of Reclamation or the Department of Ecology may request a temporary restraining order or other appropriate relief from this Court against any person/entity who fails to comply with the provisions of this Court Order Re: Metering, Measuring, and Reporting Requirements, or against any diverter who is exceeding the term or limits of his/her water right or diverting water to the injury of senior water right holders, including the Bureau of Reclamation under its leases of instream flow water rights.

IT IS FURTHER ORDERED, ADJUDGED, AND DECREED that Stan Isley shall perform necessary stream patrolman duties for the diversions from Big Creek to ensure compliance with this order and to ensure compliance with the terms and limits of the water rights appurtenant to each diversion. The water rights for the Big Creek diversions are as defined by the

ATTORNEY GENERAL OF WASHINGTON
Ecology Division
PO Box 40117
Olympia, WA 98504-0117
FAX (360) 438-7743

February 13, 1997, Conditional Final Order for Subbasin No. 2. Big Creek water users may be required to hire a stream patrolman for 1999 and subsequent water years to ensure compliance with this Court Order and with the terms and limits of their water rights, pursuant to a future order of this Court, or pursuant to RCW 90.08.

IT IS FINALLY ORDERED, ADJUDGED, AND DECREED that Stan Isley shall perform necessary monitoring and enforcement duties for the diversions from the Teanaway River Subbasin to ensure compliance with this Court Order and to ensure compliance with the terms and limits of the water rights appurtenant to each diversion. The water rights for the Teanaway River Subbasin diversions are as defined in the June 16, 1921, Amosso Decree and the January 25, 1996, Report of Referee for Subbasin No. 3 (as modified by the upcoming Supplemental Report of Referee for Subbasin No. 3); pending issuance of a Conditional Final Order for the Teanaway River Subbasin No. 3. After a Conditional Final Order is entered for Subbasin No. 3, Teanaway River Subbasin water users may be required to hire a stream patrolman for 1999 and subsequent water years to ensure compliance with this Court Order and with the terms and limits of their water rights, pursuant to a future order of this Court, or pursuant to RCW 90.08.

DONE IN OPEN COURT this 27th day of August, 1998.

Walter Stauffacher

THE HONORABLE WALTER A. STAUFFACHER

Presented by:

CHRISTINE O. GREGOIRE
Attorney General

Deborah Mull

ALAN M. REICHMAN, WSBA #23874
Assistant Attorney General
Attorneys for Plaintiff
State of Washington
Department of Ecology
(360) 459-6161

F:\CASES\AR3\ACQUAVELLA\ORDER PENDENTE LITE TEANAWAY

ATTORNEY GENERAL OF WASHINGTON
Ecology Division
PO Box 40117
Olympia, WA 98504-0117
FAX (360) 438-7743

9-1920 (Rev. Dec. 1994)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
HYDROLOGY
Po Box 1749
Yakima, WA 98907-1749

Diversion Code ____________
Diversion ____________
Water Year ____________

Day	April Gage height	April Discharge	May Gage height	May Discharge	June Gage height	June Discharge	July Gage height	July Discharge	August Gage height	August Discharge	September Gage height	September Discharge	Day
1													1
2													2
3													3
4													4
5													5
6													6
7													7
8													8
9													9
10													10
11													11
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25													25
26													26
27													27
28													28
29													29
30													30
31													31

Quarter: Fourth, Third, Second, First — Computed .... Checked .... Date ....

Quarter: Fourth, Third, Second, First — Disch. applied .... Disch. checked .... Date ....

Quarter: Fourth, Third, Second, First — G. H. copied .... G. H. chkd .... Date ....

Period
Year

approved by a hydrologic engineer from Reclamation or Ecology.

9-192-D (Rev. Dec. 1994)

Diversion Code _____

Daily Diversion, in Cubic Feet, per Second, of _____

for the Water Year commencing October 1, 19____ and ending September 30, _____

Gage/meter read to _____ once/twice a day by _____ (Observer)

Phone: _____

Day	October		November		December		January		February		March	
	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
1												
2												
3												
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27												
28												
29												
30												
31												
Total												
Mean												
Maximum												
Minimum												
Acre-feet												

Diversion records (copy of Form 192) shall be provided/mailed weekly to the US Bureau of Reclamation, Yakima Field Office, Hydrology, PO Box 1749, Yakima, WA 98907-1749.

Planned diversion changes of 2 cfs or more shall be reported at least 48 hours prior to making said changes. Unplanned diversion changes of 2 cfs or more shall be reported as soon as possible after the change. Report changes by telephoning (509) 575-5848, ext. 219 (from 8:00 AM to 4:30 PM weekdays and 8:00 AM to 10:00 AM on weekends) or after hours at (509) 575-5854 (leave message on recorder).

United States Department of the Interior

BUREAU OF RECLAMATION
Upper Columbia Area Office
1917 Marsh Road
P.O. Box 1749
Yakima, Washington 98907-1749

IN REPLY REFER TO:
UCA-1205
WTR-1.10

SEP 2 1998

Water Users in Subbasins Two and Three
Kittitas County, Washington

Subject: Metering, Measuring and Reporting Requirements, Teanaway River and Big Creek

To All Interested Parties:

The Bureau of Reclamation is enclosing with this letter a copy of the Order Pendente Lite Re: Metering, Measuring and Reporting Requirements, Teanaway River and Big Creek, Kittitas County which was recently signed by the Honorable Walter Stauffacher, the judge presiding over the adjudication, In the Matter of the Determination of the Rights to Use of the Surface Waters of the Yakima River Drainage Basin, otherwise known as State of Washington, Department of Ecology v. James J. Acquavella, No. 77-2-01484, in the Superior Court of the State of Washington for Yakima County.

A copy of the Proposed Order was previously sent to you on June 22, 1998. The relevant provisions of the Final Order are as follows:

1. All persons diverting water from the Teanaway River or its tributaries (Subbasin No. 3) or from Big Creek (within Subbasin No. 2) are required to have in place by May 1, 1999, an approved metering or measuring device.

2. Records of diversions exceeding 1 cfs must be kept on a Standard Form 192, a copy of which is enclosed.

3. Such diversion records shall be provided to the Bureau of Reclamation weekly and the Bureau will, in turn, provide copies to the Department of Ecology. Diversion records must be mailed to the Bureau of Reclamation, Yakima Field Office, Hydrology, PO Box 1749, Yakima, Washington 98907-1749.

4. Those individuals who divert less than 1 cfs and use such water purely for domestic purposes are exempt from these provisions.

5. Stan Isley, an employee of the Department of Ecology, currently on detail to the Bureau of Reclamation, has been authorized to monitor diversions on the lands covered by this Order. Such monitoring requires Mr. Isley to go onto your property for the sole purpose of monitoring diversions. Mr. Isley will be making such visits on a regular basis, somewhere between a week and ten days.

6. If it is found that any individual is exceeding the terms or limits of his or her water right and diverting water to the injury of senior water rights, appropriate action may be taken including action by the Superior Court enjoining such diversions which exceed water rights.

7. Similarly, the failure to install an approved measuring or metering device by May 1, 1999, can also result, after appropriate notice and opportunity of one month to install a device, in an action by the Superior Court.

The Bureau of Reclamation and Mr. Isley appreciate your cooperation and look forward to working with you and answering questions you might have. We plan to continue with the cooperative working relationships we have experienced with local landowners in both Subbasins No. 2 and No. 3, and will work with you to continue successful irrigation as we try to bring the fisheries back together. Mr. Isley can be reached at this office at (509) 575-5848, extension 281. Enclosed is a photocopy of a photograph of Mr. Isley to help you recognize him as he conducts his monitoring inspections.

Sincerely,

James A. Esget

James A. Esget, Manager
Yakima River Basin Water Enhancement Project

Enclosures - 3

cc: The Honorable Walter A. Stauffacher
Yakima County Superior Court
128 N 2nd Street
Yakima WA 98901-2614
(w/copy of SF-192 and photo)

JUVENILE FISH SCREEN CRITERIA

Developed by
National Marine Fisheries Service
Environmental & Technical Services Division
Portland, Oregon

Revised February 16, 1995

I. GENERAL CONSIDERATIONS:

This document provides guidelines and criteria to be utilized in the development of functional designs of downstream migrant fish passage facilities for hydroelectric, irrigation, and other water withdrawal projects. This material has been prepared by the National Marine Fisheries Service (NMFS) as a direct result of responsibilities for prescribing fishways (including fish screen and bypass systems) under Section 18 of the Federal Power Act, administered by the Federal Energy Regulatory Commission (FERC). This material is also applicable for projects that are undergoing consultation with the NMFS, pursuant to responsibilities for protecting fish under the Endangered Species Act (ESA).

Since these guidelines and criteria are general in nature, there may be cases where site constraints or extenuating circumstances dictate that certain criteria be waived or modified. Conversely, where there is a need to provide additional protection for fish, site-specific criteria may be added. These circumstances will be considered by NMFS on a project-by-project basis. In designing an effective fish screen facility, the swimming ability of the fish is a primary consideration. Research has shown that swimming ability of fish varies and may depend upon a number of factors relating to the physiology of the fish, including species, size, duration of swimming time required, behavioral aspects, migrational stage, physical condition and others, in addition to water quality parameters such as dissolved oxygen concentrations, water temperature, lighting conditions, and others. For this reason, screen criteria must be expressed in general terms.

To minimize risks to anadromous fish at some locations, the NMFS may require investigation (by the project sponsors) of important and poorly defined site-specific variables that are deemed critical to development of the screen and bypass design. This investigation may include factors such as fish behavioral response to hydraulic conditions, weather conditions (ice, wind, flooding, etc.), river stage-discharge relationships, seasonal operational variability, potential for sediment and debris problems, resident fish populations, potential for creating predation opportunity, and other information. The size of salmonids present at a potential screen site usually is not known, and can change from year to year based on flow and temperature conditions. Thus, adequate data to describe the size-time relationship requires substantial sampling efforts over a number of years. The NMFS will assume that fry-sized salmonids and low water temperatures are present

at all sites and apply the appropriate criteria listed below, unless adequate biological investigation proves otherwise. The burden-of-proof is the responsibility of the owner of the screen facility.

Proposed facilities which could have particularly significant impacts on fish, and new unproven juvenile fish protection designs, frequently require: 1) development of a biological basis for the concept; 2) demonstration of favorable fish behavioral response in a laboratory setting; 3) an acceptable plan for evaluating the prototype installation; and 4) an acceptable alternate plan developed concurrently for a screen and bypass system satisfying these criteria, should the prototype not adequately protect fish. Additional information on unproven juvenile fish protection devices can be found in "Experimental Fish Guidance Devices," Position Statement of the National Marine Fisheries Service, Northwest Region, January 6, 1995.

Screen and bypass criteria for juvenile salmonids are provided below. Specific exceptions to these criteria occur in the design of small screen and bypass systems (less than 25 cubic feet per second). These are listed in Section K, Modified Criteria for Small Screens.

Striped bass, herring, shad, and other anadromous fish species may have eggs and/or very small fry which are moved with any water current (tides, streamflows, etc.). Installations where these species are present may require special screen and/or bypass facilities, including micro-screens and require individual evaluation of the proposed project. In instances where local regulatory agencies require more stringent screening requirements for species of resident or anadromous fish, the NMFS will generally defer to the more conservative criteria.

II. GENERAL PROCEDURAL GUIDELINES

A functional design should be developed that defines type, location, size, hydraulic capacity, method of operation, and other pertinent juvenile fish screen facility characteristics. In the case of applications to be submitted to the FERC and consultations under the ESA, a functional design for juvenile (and adult) fish passage facilities must be developed and submitted as part of the application. It must reflect the NMFS input and design criteria and be acceptable to the NMFS. Functional design drawings must show all pertinent hydraulic information, including water surface elevations and flows through various areas of the structures. Functional design drawings must show general structural sizes, cross-sectional shapes, and elevations. Types of materials must be identified where they will directly affect fish. The final detailed design shall be based on the functional design, unless changes are agreed to by the NMFS.

All juvenile passage facilities shall be designed to function properly through the full range of hydraulic conditions in the lake, tidal area, or stream and in the diversion, and shall account for debris and sedimentation conditions which may occur.

III. SCREEN CRITERIA FOR JUVENILE SALMONIDS

A. Structure Placement

1. Streams and Rivers:

a. Where physically practical and biologically desirable, the screen shall be constructed at the diversion entrance with the screen face generally parallel to river flow. Physical factors that may preclude screen construction at the diversion entrance include excess river gradient, potential for damage by large debris, and potential for heavy sedimentation. For screens constructed at the bankline, the screen face shall be aligned with the adjacent bankline and the bankline shall be shaped to smoothly match the face of the screen structure to prevent eddies in front, upstream, and downstream of the screen. If trash racks are used, sufficient hydraulic gradient is required to route juvenile fish from between the trash rack and screens to safety.

b. Where installation of fish screens at the diversion entrance is not desirable or impractical, the screens may be installed in the canal downstream of the entrance at a suitable location. All screens installed downstream from the diversion entrance shall be provided with an effective bypass system approved by NMFS, designed to collect juvenile fish and safely transport them back to the river with minimum delay. The angle of the screen to flow should be adequate to effectively guide fish to the bypass (see Section F, Bypass Layout).

2. Lakes, Reservoirs and Tidal areas:

a. Intakes shall be located offshore where feasible to minimize fish contact with the facility. Water velocity from any direction toward the screen shall not exceed allowable approach velocities (see Section B, Approach Velocity). When possible, intakes shall be located in areas with sufficient sweeping velocity to minimize sediment accumulation in or around the screen and to facilitate debris removal and fish movement away from the screen face (see Section C, Sweeping Velocity).

b. If a screened intake is used to route fish past a dam, the intake shall be designed to withdraw water from the most appropriate elevation based on providing the best juvenile fish attraction and appropriate water temperature control downstream of the project. The entire range of forebay fluctuation shall be accommodated in design, unless otherwise approved by the NMFS.

B. Approach Velocity - Definition: Approach velocity is the water velocity component perpendicular to and approximately three inches in front of the screen face.

1. Salmonid fry [less than 2.36 inches {60.0 millimeters (mm)} in length]: The approach velocity shall not exceed 0.40 feet per second (fps) {0.12 meters per second (mps)}.

2. Salmonid fingerling {2.36 inches (60.0 mm) and longer}: The approach velocity shall not exceed 0.80 fps (0.24 mps).

3. The total submerged screen area required (excluding area affected by structural components) is calculated by dividing the maximum diverted flow by the allowable approach velocity (also see Section K, Modified Criteria for Small Screens).

4. The screen design must provide for uniform flow distribution over the screen surface, thereby minimizing approach velocity. This may be accomplished by providing adjustable porosity control on the downstream side of screens, unless it can be shown unequivocally (such as with a physical hydraulic model study) that localized areas of high velocity can be avoided at all flows.

C. Sweeping Velocity - Definition: Sweeping velocity is the water velocity component parallel and adjacent to the screen face.

1. Sweeping velocity shall be greater than the approach velocity. This is accomplished by angling the screen face at less than 45 degrees; relative to flow (also see Section K, Modified Criteria for Small Screens). This angle may be dictated by site specific canal geometry, hydraulic, and sediment conditions.

D. Screen Face Material

1. Fry criteria - If biological justification can not be provided to demonstrate the absence of fry-sized salmonids {less than 2.36 inches (60.0 mm)} in the vicinity of the diversion intake leading to the screen, fry will be assumed present and the following criteria apply for screen material:

a. Perforated plate: Screen openings shall not exceed 3/32 or 0.0938 inches (2.38 mm).

b. Profile bar screen: The narrowest dimension in the screen openings shall not exceed 0.0689 inches (1.75 mm) in the narrow direction.

c. Woven wire screen: Screen openings shall not exceed 3/32 or 0.0938 inches (2.38 mm) in the narrow direction (example: 6-14 mesh).

d. Screen material shall provide a minimum of 27% open area.

2. Fingerling criteria - If biological justification can be provided to demonstrate the absence of fry-sized salmonids {less than 2.36 inches (60.0 mm)} in the vicinity of the diversion intake leading to the screen, the following criteria apply for screen material:

a. Perforated plate: Screen openings shall not exceed 1/4 or 0.25 inches (6.35 mm).

b. Profile bar screen: The narrowest dimension in the screen openings shall not exceed 1/4 or 0.25 inches (6.35 mm) in the narrow direction.

c. Woven wire screen: Screen openings shall not exceed 1/4 or 0.25 inches (6.35 mm) in the narrow direction.

d. Screen material shall provide a minimum of 40% open area.

3. The screen material shall be corrosion resistant and sufficiently durable to maintain a smooth uniform surface with long term use.

E. Civil Works and Structural Features

1. The face of all screen surfaces shall be placed flush (to the extent possible) with any adjacent screen bay, pier noses, and walls to allow fish unimpeded movement parallel to the screen face and ready access to bypass routes.

2. Structural features shall be provided to protect the integrity of the fish screens from large debris. Provision of a trash rack, log boom, sediment sluice, and other measures may be needed. A reliable, ongoing preventative maintenance and repair program is necessary to assure facilities are kept free of debris and that screen mesh, seals, drive units, and other components are functioning correctly.

3. Screen surfaces shall be constructed at an angle to the approaching flow, with the downstream end of the screen terminating at the entrance to the bypass system.

4. The civil works shall be designed in a manner that eliminates undesirable hydraulic effects (such as eddies and stagnant flow zones) that may delay or injure fish or provide predator habitat or predator access. Upstream training wall(s), or some acceptable variation thereof, shall be utilized to control hydraulic conditions and define the angle of flow to the screen face. Large facilities may require hydraulic modeling to identify and correct areas of concern.

F. Bypass Layout

1. The screen and bypass shall work in tandem to move out-migrating salmonids (including adults) to the bypass outfall with a minimum of injury or delay. The bypass entrance shall be located so that it can easily be located by out-migrants. Screens placed in diversions shall be constructed with the downstream end of the screen terminating at a bypass entrance. Multiple bypass entrances (intermediate bypasses) shall be employed if the sweeping velocity will not move fish to the bypass within 60 seconds, assuming fish are transported at this velocity.

2. The bypass entrance and all components of the bypass system shall be of sufficient size and hydraulic capacity to minimize the potential for debris blockage.

3. In order to improve bypass collection efficiency for a single bank of vertically-oriented screens, a bypass training wall shall be located at an angle to the screens, with the bypass entrance at the apex and downstream-most point. This will aid fish movement into the bypass by creating hydraulic conditions that conform to observed fish behavior. For single or multiple vee screen configurations, training walls are not required, unless a intermediate bypass is used (see Section F, Bypass Layout, Part 1).

4. In cases where there is insufficient flow available to satisfy hydraulic requirements at the bypass entrance (entrances) for the main screens, a secondary screen may be required. This is a screen located in the main screen bypass which allows the prescribed bypass flow to be used to effectively attract fish into the bypass entrance(s) and then allow for all but a reduced residual bypass flow to be routed back (by pump or gravity) for the primary diversion use. The residual bypass flow (not passing through the secondary screen) would then convey fish to the bypass outfall location or other destination.

5. Access is required at locations in the bypass system where debris accumulations may occur.

6. The screen civil works floor shall be designed to allow fish to be routed back to the river safely, if the canal is dewatered. This may entail a sumped drain with a small gate and drain pipe, or similar provisions.

G. Bypass Entrance

1. Each bypass entrance shall be provided with independent flow-control capability, acceptable to NMFS.

2. The minimum bypass entrance flow velocity must be greater than or equal to the maximum flow velocity vector resultant upstream of the screens. A gradual and efficient acceleration of flow into the bypass entrance is required to minimize delay by out-migrants.

3. Ambient lighting conditions are required at, and inside of, the bypass entrance and should extend downstream to the bypass flow control.

4. The bypass entrance must extend from the floor to the canal water surface.

H. Bypass Conduit Design

1. Bypass pipes shall have smooth surfaces and be designed to provide conditions that minimize turbulence. Bypass conduits shall have a smooth joint design to minimize turbulence and the potential for fish injury and shall be satisfactory to the NMFS.

2. Fish shall not be pumped within the bypass system.

3. Fish shall not be allowed to free-fall within a confined shaft in a bypass system.

4. Pressures in the bypass pipe shall be equal to or above atmospheric pressures.

5. Bends shall be avoided in the layout of bypass pipes due to the potential for debris clogging. Bypass pipe center-line radius of curvature (R/D) shall be greater than or equal to 5. Greater R/D may be required for super-critical velocities.

6. Bypass pipes or open channels shall be designed to minimize debris clogging and sediment deposition and to facilitate cleaning as necessary. Therefore, the required pipe diameter shall be greater than or equal to 24 inches {0.610 meters (m)}, and pipe velocity shall be greater than 2.0 fps (0.610 mps), unless otherwise approved by the NMFS, for the entire operational range (also see Section K, Modified Criteria for Small Screens, Part 4).

7. Closure valves of any type are not allowed within the bypass pipe, unless approved by NMFS.

8. The minimum depth of open-channel flow in a bypass conduit shall be greater than or equal to 0.75 feet (0.23 m), unless otherwise approved by the NMFS (also see Section K, Modified Criteria for Small Screens, Part 5).

9. Sampling facilities installed in the bypass conduit shall not impair normal operation of the facility.

10. The bypass pipe hydraulics should not produce a hydraulic jump within the pipe.

I. Bypass Outfall

1. Bypass outfalls should be located such that ambient river velocities are greater than 4.0 fps (1.2 mps).

2. Bypass outfalls shall be located to minimize avian and aquatic predation in areas free of eddies, reverse flow, or known predator habitat.

3. Bypass outfalls shall be located where the receiving water is of sufficient depth (depending on the impact velocity and quantity of bypass flow) to ensure that fish injuries are avoided at all river and bypass flows.

4. Maximum bypass outfall impact velocity (including vertical and horizontal velocity components) shall be less than 25.0 fps (7.6 mps).

5. The bypass outfall discharge into tailrace shall be designed to avoid adult attraction or jumping injuries.

J. Operations and Maintenance

1. Fish screens shall be automatically cleaned as frequently as necessary to prevent accumulation of debris. The cleaning system and protocol must be effective, reliable, and satisfactory to the NMFS. Proven cleaning technologies are preferred.

2. Open channel intakes shall include a trash rack in the screen facility design which shall be kept free of debris. In certain cases, a satisfactory profile bar screen design can substitute for a trash rack.

3. The head differential to trigger screen cleaning for intermittent type cleaning systems shall be a maximum of 0.1 feet (0.03 m) or as agreed to by the NMFS.

4. The completed screen and bypass facility shall be made available for inspection by NMFS, to verify compliance with the design and operational criteria.

5. Screen and bypass facilities shall be evaluated for biological effectiveness and to verify that hydraulic design objectives are achieved.

K. Modified Criteria for Small Screens (Diversion flow less than 25 cfs)

The following criteria vary from the criteria listed above and apply to smaller screens. Twenty-five cfs is an approximate cutoff; however, some smaller diversions may be required to apply more universal criteria listed above, while some larger diversions may be allowed to use the "small screen" criteria listed below. This will depend on site constraints.

1. The screen area required is shown in Section B, Approach Velocity, Parts 1, 2 and 3. Note that "maximum" applies to the greatest flow diverted, not necessarily the water right.

2. Screen orientation:

a. For screen lengths less than or equal to 4 feet, screen orientation may be angled or perpendicular relative to flow.

b. For screen lengths greater than 4 feet, screen-to-flow angles must be less than or equal to 45 degrees (see Section C, Sweeping Velocity, Part 1).

c. For drum screens, the design submergence shall be 75% of drum diameter. Submergence shall not exceed 85%, nor be less than 65% of drum diameter.

3. The minimum bypass pipe diameter shall be 10 inches, unless otherwise approved by NMFS.

4. The minimum allowable pipe depth is 0.15 feet (1.8 inches or 4.6 cm) and is controlled by designing the pipe gradient for minimum bypass flow.

Questions concerning this document can be directed to NMFS Environmental and Technical Services Division Engineering staff, at 503-230-5400.

Adopted,

William Stelle, Jr. Date
Regional Director

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
Screening Requirements For Water Diversions

Washington State Laws (RCW 77.16.220; RCW 77.55.040 (formerly RCW 75.20.040), RCW 77.55.070 (formerly RCW 75.20.061)) require all diversions from waters of the state to be screened to protect fish.

These laws and the following design criteria are essential for the protection of fish at surface water diversions. Fish drawn into hydropower, irrigation, water supply, and other diversions are usually lost from the fish resources of the state of Washington.

The following criteria are based on the philosophy of physically excluding fish from being entrained in water diverted without becoming impinged on the diversion screen. The approach velocity and screen mesh opening criteria are based upon the swimming stamina of emergent size fry in low water temperature conditions. It is recognized that there may be locations at which design for these conditions may not be warranted. Unless conclusive data from studies acceptable to Washington Department of Fish and Wildlife indicate otherwise, it is assumed that these extreme conditions exist at some time of the year at all screen sites.

Additional criteria may be required for unique situations, large facilities or intakes within marine waters.

I. Screen Location and Orientation

A. Fish screens in rivers and streams shall be constructed within the flowing stream at the point of diversion and parallel to the stream flow. The screen face shall be continuous with the adjacent bankline. A smooth transition between the screen and bankline shall be provided to prevent eddies in front, upstream and downstream of the screen.

   Where it can be thoroughly demonstrated that flow characteristics or site conditions make construction or operation of fish screens at the diversion entrance impractical, the screens may be installed in the canal downstream of the diversion.

B. Diversion intakes in lakes and reservoirs shall be located offshore in deep water to minimize the exposure of juvenile fish to the screen. Salmon and trout fry generally inhabit shallow water areas near shore.

C. Screens constructed in canals and ditches shall be located as close as practical to the diversion. They shall be oriented so the angle between the face of the screen and the approaching flow is no more than 45. All screens constructed downstream of the diversion shall be provided with an efficient bypass system.

II. Approach Velocity

The approach velocity is defined as the component of the local water velocity vector perpendicular to the face of the screen. Juvenile fish must be able to swim at a speed equal or greater than the approach velocity for an extended length of time to avoid impingement on the screen. The following approach velocity criteria are maximum velocities that shall not be exceeded anywhere on the face of the screen. A maximum approach velocity of 0.4 feet per second is allowed.

The approach velocity is calculated based on the gross screen area not the net open area of the screen mesh.

The intake structure and/or fish screen shall be designed to assure that the diverted flow is uniformly distributed through the screen so the maximum approach velocity is not exceeded.

III. Minimum Screen Area

The minimum required screen area is determined by dividing the maximum diverted flow by the maximum allowable approach velocity. To find the screen area in square feet, divide the diverted flow in cubic feet per second (450 gpm = 1.0 cubic foot per second) by the approach velocity 0.4 feet per second):

$$\textit{Minimum Screen Area} = \frac{\textit{Diverted Flow (cubic feet /second)}}{\textit{Approach Velocity (feet per second)}}$$

The minimum required screen area must be submerged during lowest stream flows and may not include any area that is blocked by screen guides or structural members.

Diversions less than or equal to 180 gallons/minute (0.4 cfs) require a minimum submerged screen area of 1.0 square foot, which is the smallest practical screening device.

IV. Sweeping Velocity

The sweeping velocity is defined as the component of the water velocity vector parallel to and immediately upstream of the screen surface. The sweeping velocity shall equal or exceed the maximum allowable approach velocity. The sweeping velocity requirement is satisfied by a combination of proper orientation (angle of screen 45 to the approaching flow) of the screen relative to the approaching flow and adequate bypass flow.

Screen bay piers or walls adjacent to the screen face shall be flush with screen surfaces so the sweeping velocity is not impeded.

V. Screen Mesh Size, Shape, and Type of Material

Screen openings may be round, square, rectangular, or any combination thereof, provided structural integrity and cleaning operations are not impaired.

Screen mesh criteria is based on the assumption that steelhead and/or resident trout fry are ubiquitous in the state of Washington and will be present at all diversion sites.

Following are the maximum screen openings allowable for emergent salmonid fry. The maximum opening applies to the entire screen structure including the screen mesh, guides, and seals. The profile bar criteria is applied to the narrow dimension of rectangular slots or mesh.

Woven Wire Mesh	Profile Bar	Perforated Plate
0.087 inch (6-14 mesh)	1.75 mm (0.069 inch)	0.094 inch (3/32 inch)

The allowable woven wire mesh openings is the greatest open space distance between mesh wires. An example allowable mesh specifications is provided; there are other standard allowable openings available. The mesh specification gives the number of mesh openings per lineal inch followed by the gauge of the wires. For example, 6-14 mesh has six mesh openings per inch of screen. It is constructed with 6, 14-gauge (0.080 inch diameter) wires per inch.

The profile bar openings are the maximum allowable space between bars. The allowable perforated plate openings are the diameter of circular perforations. Perforated slots are treated as profile bars.

Screens may be constructed of any durable material; woven, welded, or perforated. The screen material must be resistant to corrosion and ultraviolet damage.

For longevity and durability, minimum wire diameter for woven mesh shall be 0.060 inch (18 gauge) on fixed panel screens, where they are not subjected to impact of debris. Minimum wire diameter for woven mesh shall be 0.080 inch (14 gauge) for rotary drum screens, traveling belt screens, and in areas where there is a potential for damage from floating debris or cleaning operations.

VI. Bypass

All screens constructed downstream of the diversion shall be provided with an efficient bypass system to rapidly collect juvenile fish and safely transport them back to the river. The downstream end of the screen shall terminate at the entrance to the bypass system. It is the water diversion owner's responsibility to obtain necessary water rights to operate the fish bypass; failure to do so may be considered failure to meet state screening law requirements.

VII. Cleaning

Fish screens shall be cleaned as frequently as necessary to prevent obstruction of flow and violation of the approach velocity criterion. Automatic cleaning devices will be required on large screen facilities.

Additional detailed information is available explaining the background and justification of these criteria and showing standard details of flow distributors, acceptable bypass designs, and screen areas required for various flows.

For further information contact:

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Partial List of Research Projects in Yakima Basin

8/2000

Washington Department of Fish and Wildlife (Pearson's Group)

Long-term monitoring of multiple species
Lower river predator studies
Competition for space and food among species in the upper Yakima
Behavior interactions - dominance relationships among spring chinook and other species
Percocialism and residualism in spring chinook
Impacts of gravel pit mines on fishes
Effects of nutrient additions (salmon carcass analogues) on fishes (proposed)

WDFW studies (Easterbrook group)

- spawning surveys for several species
- monitor catch rates for various species
- conducting fish surveys in the drains

State Salmon board Projects - limiting factors analysis

Ecology

- water quality studies
- fish tissue study in upper Yakima
- water quality study in Granger Drain
- Teanaway temperature and TMDL study
- metals assessment in the upper Yakima River
- sediment studies in the Upper Yakima basin
- water quality studies in the lower river

SOAC

- application of RVA for Yakima River
- EDT model
- studies to investigate appropriate spawning and incubation flow
- studies related to fish issues and maintenance activities at Roza and Chandler

Yakima-Klickitat Fisheries Program (Natural Production/Genetics/Harvest/Eco Interactions)

Ecosystem Diagnosis and Treatment modeling effort
Yakima River fall chinook fry survival study
Yakima River coho life history study
Yakima River juvenile spring chinook microhabitat utilization study (monitor carry capacity)
Juvenile wild/hatchery pit spring chinook PIT tag study to estimate wild and hatchery survivals
Yakima River fall chinook optimal raring treatment
Yakima River coho optimal stock, temporal, and geographic
Yakima spring chinook juvenile behavior

Yakima spring chinook juvenile morphomentric/coloration
Yakima spring chinook smolt physiology
Adult salmonid enumeration at Prosser
Adult salmonid enumeration and broodstock collection at Roza and Cowiche Dams
Spawning ground surveys (redd counts)
Yakima spring chinook spawning behavior observations
Yakima spring chinook residual/precocials studies
Yakima River relative hatchery/wild spring chinook and coho reproductive success
Yakima spring chinook gamete quality monitoring
Scale analysis
Fish health monitoring
Habitat monitoring lights and ground truthing
Out-of-basin environmental monitoring
Trophic enhancement research
Sediment impacts on habitat
Predator avoidance training
Population viability analysis for all YKFP target stocks
Allozyme/DNA data collection and analysis
Stray recovery on Naches and American River spawning grounds
Avian predation index
Fish predation index
coho/chinook predation study
Indirect predation
Yakima River spring chinook competition/prey index
Upper Yakima spring chinook non target taxa monitoring
Pathogen sampling

Other YN research

- Toppenish and Satus Creeks
- Habitat coordination efforts (restoring rearing habitat by dike breaching, installing screens, etc.) Scott Nicolai

USFWS

- working throughout basin with various entities
- developing survey protocols for bull trout

USGS

- NAWQA study (various water quality studies focusing on pesticides)
- fall chinook spawning study

Forest Service studies

- routine spawning and fish distribution studies
- genetic studies on rainbow trout and cutthroat trout
- water temperature monitoring in both upper Yakima and Naches, including the Teanaway, Taneum, Manastash, Cle Elum, Swauk, Box canyon
- sediment monitoring
- culvert passage inventories

Reclamation

Synthesis (Stanford/Esget/YRBWEP)
Reaches study (Stanford/Esget/YRBWEP)
Pumping plant studies (Stanford/Croci/Esget/YRBWEP)
Wapatox studies (Stanford/Croci/Esget/YRBWEP)
Gold Creek Study (Didrickson/Puckett/ESA)
Incubation flow study (Bowen/Larrick/UCAO)
Population status/life history of bull trout (James/Puckett/ESA)
Clear Creek Ladder Evaluation (Harza/Larrick/ESA)
Limnology studies (Hiebert/Puckett/ESA)
Non salmonid fish surveys (Karp/Puckett/UCAO)
Rimrock entrainment study (Hiebert/Larrick/ESA)
Steelhead spawning distribution study above Roza (Karp/Larrick/ESA) (Proposed)
Bull trout surveys - Easton - Keechelus and above Cle Elum (FWS-Thomas/Croci/ Kaumheimer/ ESA)
Survey of habitat above Keechelus Dam)FWS-Thomas/Kaumheimer/Keechelus SOD)
Topographic/ortho-photo data collection in Yakima basin (Sharp/Young/UCAO) (proposed)

Central Washington University

- mapping studies with Stanford
- various fish studies; Paul James and others

Districts

- temperature monitoring/modeling
- water quality monitoring

Various other entities

Kittitas Conservation District - various land use mapping activities